

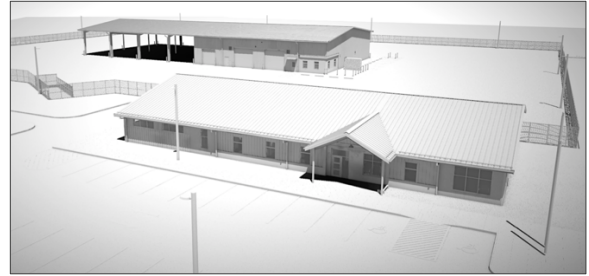
PROJECT MANUAL | BID REQUIREMENTS AND SPECIFICATIONS FOR:

Dept of Agriculture & Consumer Services
North Carolina Forest Service

REGION-1 HEADQUARTERS

260 Airport Road, Kenansville, North Carolina 28349

NCSCO#: 19-20001-02A



CONSTRUCTION DOCUMENTS | BID SET
24 JUNE 2025

OWNER:

NC DEPT OF AGRICULTURE & CONSUMER SERVICES
2 WEST EDENTON STREET
RALEIGH, NC 27601
PHONE: 919-707-3238
ncagr.gov

NORTH CAROLINA FOREST SERVICE
412 NORTH SALISBURY STREET
RALEIGH, NC 27604
PHONE: 919-857-4801
ncforestservice.gov

ARCHITECT:

WILLIARD STEWART ARCHITECTS, PA
122 COX AVENUE
RALEIGH, NORTH CAROLINA 27605
PHONE: 919-834-0620
williardstewartarchitects.com

CONSULTANTS:

CIVIL ENGINEERING, LANDSCAPE ARCHITECTURE:

TIMMONS GROUP
5410 TRINITY ROAD, SUITE 102
RALEIGH, NORTH CAROLINA 27607
PHONE: 919-866-4951
timmons.com

*MECHANICAL, ELECTRICAL, PLUMBING,
& FIRE PROTECTION ENGINEERING:*

ATLANTEC ENGINEERS, PA
NOW **IMEG CONSULTANTS CORP.**
3221 BLUE RIDGE ROAD, SUITE 113
RALEIGH, NORTH CAROLINA 27612
PHONE: 919-571-1111
atlantecengineers.com

STRUCTURAL ENGINEERING:

ROSS LINDEN ENGINEERS PC
709 WEST JONES STREET
RALEIGH, NORTH CAROLINA 27603
PHONE: 919-832-5680
rosslinden.com

EQUIPMENT DESIGN:

HDR
11700 KATY FREEWAY, SUITE 250, ENERGY TOWER 1
HOUSTON, TEXAS 77079
PHONE: 346-365-6006
hdrinc.com

REGION 1 HEADQUARTERS**CERTIFICATION**

I hereby certify that the specifications contained herein, and the accompanying plans were prepared by me or under my direct supervision.

00 00 02	Table of Contents	07 41 13	Formed Metal Wall Panels
00 00 03	Advertisement for Bids	07 62 00	Sheet Metal Flashing and Trim
00 00 04	Notice to Bidders	07 72 53	Snow Guards
00 00 06	Supplementary General Conditions	07 92 00	Joint Sealants
00 00 08	Form of Proposal	08 11 13	Hollow Metal Doors and Frames
01 10 00	Summary of Work	08 14 16	Flush Wood Doors
01 21 00	Allowances	08 31 13	Access Doors and Frames
01 22 00	Unit Prices	08 33 23	Overhead Coiling Doors
01 23 00	Alternates	08 41 13	Aluminum Framed Entrances and Storefronts
01 25 00	Substitution Procedures	08 71 00	Door Hardware
01 26 00	Contract Modification Procedures	08 71 13	Automatic Door Operators
01 29 00	Payment Procedures	08 80 00	Glass and Glazing
01 31 00	Project Management Coordination	09 91 00	Louvers and Vents
01 32 00	Construction Progress Documentation	09 29 00	Gypsum Board Assemblies
01 32 33	Photographic Documentation	09 30 00	Ceramic and Porcelain Tile
01 33 00	Submittal Procedures	09 51 13	Acoustical Panel Ceilings
01 40 00	Quality Requirements	09 65 13	Resilient Base and Accessories
01 42 00	References	09 65 19	Resilient Tile Flooring
01 50 00	Temporary Facilities and Controls	09 65 19	Vinyl Plank and Tile
01 60 00	Product Requirements	09 91 10	Painting
01 73 00	Execution Requirements	09 96 00	High Performance Coatings
01 77 00	Closeout Procedures	10 11 00	Visual Display Units
01 79 00	Demonstration and Training	10 14 00	Signage
03 35 16	Concrete Floor Sealing and Hardening	10 21 13	Solid-Polymer Toilet Compartments
03 35 46	Honed and Polished Concrete Finishing	10 12 39	Manually Operated Acoustical Panel Partitions
04 20 00	Unit Masonry	10 28 00	Toilet, Bath, and Laundry Accessories
05 50 00	Metal Fabrications	10 44 13	Fire Protection Cabinets
05 51 13	Metal Pan Stairs	10 44 16	Fire Extinguishers
05 52 13	Pipe and Tube Railings	10 51 13	Metal Lockers
06 10 53	Miscellaneous Rough Carpentry	10 75 00	Flagpoles
06 16 00	Sheathing	11 31 00	Residential and Commercial Appliances
06 20 00	Finish Carpentry	12 24 13	Roller Shades
06 41 16	Plastic Laminate-Clad Architectural Cabinets	13 34 19	Metal Building Systems
06 60 01	Solid Surfacing Countertops	34 71 13	Vehicle Barriers – Plastic Security Post Covers
07 21 00	Thermal Insulation		

Signed, Sealed, And Dated This 24th Day Of June 2025.

Project Name: North Carolina Forest Service Region-1 Headquarters

SCO Project ID No: 19-20001-02A WSA Project No: 700-19-02

BY: **Paul W. Stewart, III AIA**
 Williard Stewart Architects, PA
 122 Cox Avenue, Raleigh, North Carolina 27605



**NORTH CAROLINA FOREST SERVICE
REGION 1 HEADQUARTERS**

SCO ID: 19-20001-02A

CERTIFICATION

I hereby certify that the specifications contained herein, and the accompanying plans were prepared by me or under my direct supervision.

014100 Statement of Special Inspections

033000 Cast-In-Place Concrete

Signed, Sealed, And Dated This 24 Day Of June, 2025.

Project Name: North Carolina Forest Service Region-1 Headquarters

SCO Project ID No: 19-200001-02A WSA Project No: 700-19-02

**BY: Brian M. Ross, PE
Ross Linden Engineers PC
709 W. Jones Street
Raleigh, North Carolina 27603**



SEAL NOT VALID UNLESS SIGNED AND DATED

CERTIFICATION

I hereby certify that the specifications contained herein, and the accompanying plans were prepared by me or under my direct supervision.

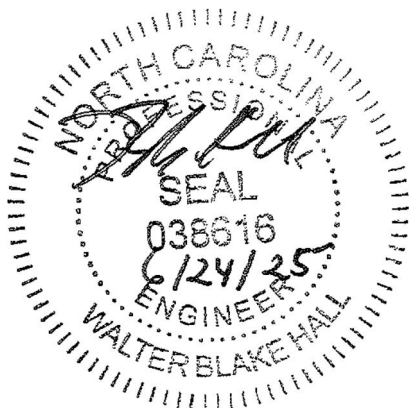
02 41 19 Selective Site Demolition
21 30 00 Fire Pumps
31 00 00 General Sitework and Earthwork Requirements
31 10 00 Site Clearing
31 20 00 Earth Moving
31 31 16 Termite Control
31 50 00 Erosion Control
31 50 00 Excavation Support and Protection
32 12 16 Asphalt Paving
32 13 13 Concrete Paving
32 17 00 Pavement Markings, Signs and Specialties
32 31 13 Chain Link Fences and Gates (PVC Clad)
32 92 00 Lawns and Grasses
32 93 00 Exterior Plants
33 10 00 Site Water Utilities
33 30 00 Site Sanitary Sewerage Utilities
33 40 00 Storm Drainage Utilities
43 41 11 Glass Coated Bolted Steel Potable Water Tanks

Signed, Sealed, And Dated This 24th Day Of 2025.

Project Name: North Carolina Forest Service Region-1 Headquarters

SCO Project ID No: 19-200001-02A WSA Project No: 700-19-02

BY: W. Blake Hall
Timmons Group
5410 Trinity Road, Suite 102
Raleigh, North Carolina 27607



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230533	IDENTIFICATION OF HVAC COMPONENTS
230593	TESTING AND BALANCING
230700	INSULATION
232000	PIPE AND PIPE FITTINGS
233000	DUCTWORK
233400	FANS
233700	AIR DISTRIBUTION
235533	GAS FIRED UNIT HEATER
236213	AIR COOLED CONDENSING UNIT
237300	AIR HANDLING UNIT
238143	SPLIT SYSTEM HEAT PUMP
238239	ELECTRIC UNIT HEATER



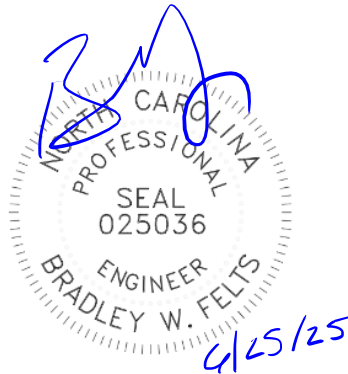
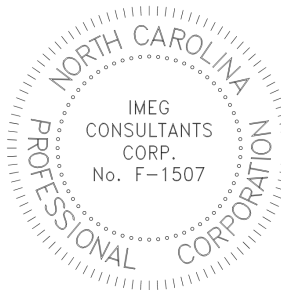
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285000	BI-DIRECTIONAL ANTENNNA SYSTEM (BDA)
285500	RF SURVEY FOR EMERGENCY RESPONDER RADIO ANTENNA/REPEATER SYSTEM



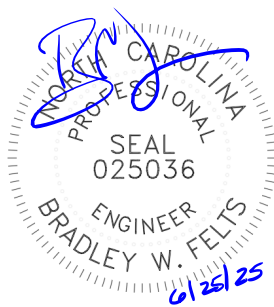
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CERTIFICATION

I hereby certify that the specifications contained herein, and the accompanying plans were prepared by me or under my direct supervision.

105600 Storage Equipment
111100 Vehicle Service Equipment
111113 Compressed Air Vehicle Service Equipment
111129 Vehicle Shop Equipment
112419 Vacuum Equipment
144500 Vehicle Lifts
453900 Fabricated Equipment

Signed, Sealed, And Dated This 24th Day Of June 2025.

Project Name: North Carolina Forest Service Region-1 Headquarters
SCO Project ID No: 19-200001-02A WSA Project No: 700-19-02

BY: **Justin T. Green, PE**
HDR
1670 Broadway, Suite 3400
Denver, CO 80202

HDR North Carolina Office:

440 South Church Street, Suite 1200
Charlotte, NC 28202
Firm Eng License No. F-0116



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ADVERTISEMENT FOR BIDS

Sealed proposals will be received until **2:00 PM on Tuesday, August 12, 2025**, in the conference room of the Aviation East North Carolina Forest Service Duplin Hanger (212 Airport Road, Kenansville, North Carolina, 28349) for the construction of the North Carolina Forest Service Region 1 Headquarters, at which time and place bids will be publicly opened and read.

Bidders are encouraged to hand deliver their sealed proposals to the Aviation East North Carolina Forest Service Duplin Hanger on the day of bid opening. Sealed proposals may also be shipped/delivered to the North Carolina Department of Agriculture & Consumer Services, ATTN: Andrew Meier, 2 W Edenton Street, Raleigh, 27601. Sealed proposal envelopes must be marked with 'Bid for North Carolina Forest Service Region 1 Headquarters'. Bidders are responsible for ensuring delivery of shipped/delivered proposals before the scheduled bid opening. Proposals that are shipped or delivered to the North Carolina Department of Agriculture & Consumer Services Office must be received prior to the bid opening by no later than 2:00pm on Monday, August 11, 2025. Shipped/delivered proposals will remain sealed until the date/time of the bid opening.

A MANDATORY Pre-Bid Meeting for interested General Contractors will be held in the conference room of the Aviation East North Carolina Forest Service Duplin Hanger (212 Airport Road, Kenansville, North Carolina, 28349) at **2:00 PM on Tuesday, July 15, 2025**.

Complete plans and specifications for this project can be obtained from:

Williard Stewart Architects, PA
122 Cox Avenue
Raleigh, NC 27606

Paul Stewart
paul@wscarchitects.com
(919) 740-5521

Bidders must be duly licensed according to State of the North Carolina Statutes Chapter 87 and must complete HUB participation forms provided in the Project Manual or their bid may be considered non-responsive. The State reserves the unqualified right to reject any and all proposals.

NOTICE TO BIDDERS

Sealed proposals will be received by the North Carolina Department of Agriculture & Consumer Services in the conference room of the Aviation East North Carolina Forest Service Duplin Hanger (212 Airport Road, Kenansville, North Carolina, 28349) until **2:00 PM on Tuesday, August 12, 2025**, and will immediately thereafter be publicly opened and read for the furnishing of labor, equipment, and materials entering into the construction of:

North Carolina Forest Service Region 1 Headquarters
Duplin County Airpark
Kenansville, North Carolina

PROJECT DESCRIPTION:

New pre-engineered metal administrative building and maintenance/storage building, and associated sitework including utilities, paving, gravel lot, fencing, and landscaping.

Bids will be received for a **Single Prime Contract**. All proposals shall be **lump sum**.

PRE-BID MEETING:

An open **MANDATORY** Pre-Bid Meeting for interested general contractors will be held in the conference room of the Aviation East North Carolina Forest Service Duplin Hanger (212 Airport Road, Kenansville, North Carolina, 28349) at **2:00 PM on Tuesday, July 15, 2025**. The meeting will address project specific questions, issues, bidding procedures, and bid forms.

The meeting is also to identify preferred brand alternates and their performance standards that the owner will consider for approval on this project.

In accordance with General Statute GS 133-3, Specifications may list one or more preferred brands as an alternate to the base bid in limited circumstances. Specifications containing a preferred brand alternate under this section must identify the performance standards that support the preference. Performance standards for the preference must be approved in advance by the owner in an open meeting. Any alternate approved by the owner shall be approved only where (i) the preferred alternate will provide cost savings, maintain or improve the functioning of any process or system affected by the preferred item or items, or both, and (ii) a justification identifying these criteria is made available in writing to the public.

In accordance with GS133-3 and SCO procedures the following preferred brand items are being considered as Alternates by the owner for this project:

Alternate G-2: Provide Owner Preferred Alternate for Door Hardware in Both Buildings.

Justification of any approvals will be made available to the public in writing no later than seven (7) days prior to bid date.

PROJECT DOCUMENTS:

Complete plans, specifications, and contract documents may be obtained free of charge via email by contacting Paul Stewart at Williard Stewart Architects, PA at paul@wscarchitects.com. Contract Documents will be emailed to interested bidders in PDF format. No plan deposit is required.

Complete plans, specifications, and contract documents will be provided to the following plan rooms and plan services:

Carolinas Associated General Contractors (CAGC) through ConstructConnect: projects.constructconnect.com.

Dodge Data & Analytics: construction.com.

North Carolina Institute of Minority Economic Development (NCIMED): theinstitutenc.org.

Hispanic Contractors Association of the Carolinas (HCAC): thehcac.org.

BIDS:

If a contractor is bidding under the dual system **both** as a single prime contractor **and** as a separate prime contractor, the bids **must be** submitted on separate forms and **in separate envelopes**. Bidders should clearly indicate on the outside of the bid envelope which contract(s) they are bidding.

NOTE: The bidder shall include **with the bid proposal** the form *Identification of Minority Business Participation* identifying the minority business participation it will use on the project **and** shall include either *Affidavit A* or *Affidavit B* as applicable. Forms and instructions are included within the Proposal Form in the bid documents. Failure to complete these forms is grounds for rejection of the bid. (GS143-128.2c Effective 1/1/2002.)

All contractors are hereby notified that they must have proper license as required under the state laws governing their respective trades.

General Contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for *Building Contractor – Unlimited License*.

NOTE--SINGLE PRIME CONTRACTS: Under GS 87-1, a contractor that superintends or manages construction of any building, highway, public utility, grading, structure or improvement shall be deemed a "general contractor" and shall be so licensed. Therefore a single prime project that involves other trades will require the single prime contractor to hold a proper General Contractors license. **EXCEPT:** On public buildings being bid single prime, where the total value of the general construction does not exceed 25% of the total construction value, contractors under GS87- Arts 2 and 4 (Plumbing, Mechanical & Electrical) may bid and contract directly with the Owner as the single prime CONTRACTOR and may subcontract to other properly licensed trades. GS87-1.1- Rules .0210

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company, insured by the Federal Deposit Insurance Corporation, of an amount equal to not less than five percent (5%) of the proposal, or in lieu thereof a bidder may offer a bid bond of five percent (5%) of the bid executed by a surety company licensed under the laws of North Carolina to execute the contract in accordance with the bid bond. Said deposit shall be retained by the Owner as liquidated damages in even of failure of the successful bidder to execute the contract within ten days after the award or to give satisfactory surety as required by law.

A performance bond and a payment bond will be required for one hundred percent (100%) of the contract price.

Payment will be made based on ninety-five percent (95%) of monthly estimates and final payment made upon completion and acceptance of work.

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of 30 days.

The owner reserves the right to reject any or all bids and to waive informalities.

Designer:
WILLIARD STEWART ARCHITECTS, PA
122 COX AVENUE
RALEIGH, NORTH CAROLINA 27605
PHONE: 919-834-0620
williardstewartarchitects.com

Owner:
NC DEPT OF AGRICULTURE & CONSUMER SERVICES
2 WEST EDENTON STREET
RALEIGH, NC 27601
PHONE: 919-707-3238
ncagr.gov

NORTH CAROLINA FOREST SERVICE
412 NORTH SALISBURY STREET
RALEIGH, NC 27604
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ncforestservice.gov

**INSTRUCTIONS TO BIDDERS
AND
GENERAL CONDITIONS OF THE CONTRACT**

STANDARD FORM FOR CONSTRUCTION PROJECTS

**STATE CONSTRUCTION OFFICE
NORTH CAROLINA
DEPARTMENT OF ADMINISTRATION**

Form OC-15

This document is intended for use on State capital construction projects and shall not be used on any project that is not reviewed and approved by the State Construction Office. Extensive modification to the General Conditions by means of “Supplementary General Conditions” is strongly discouraged. State agencies and institutions may include special requirements in “Division 1 – General Requirements” of the specifications, where they do not conflict with the General Conditions.

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INSTRUCTIONS TO BIDDERS

For a proposal to be considered it must be in accordance with the following instructions:

1. PROPOSALS

Proposals must be made in strict accordance with the Form of Proposal provided therefor, and all blank spaces for bids, alternates, and unit prices applicable to bidder's work shall be properly filled in. When requested alternates are not bid, the proposer shall so indicate by the words "No Bid". Any blanks shall also be interpreted as "No Bid". The bidder agrees that bid on Form of Proposal detached from specifications will be considered and will have the same force and effect as if attached thereto. Photocopied or faxed proposals will not be considered. Numbers shall be stated both in writing and in figures for the base bids and alternates. If figures and writing differ, the written number will supersede the figures.

Any modifications to the Form of Proposal (including alternates and/or unit prices) will disqualify the bid and may cause the bid to be rejected.

The bidder shall fill in the Form of Proposal as follows:

- a. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.
- b. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.
- c. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.
- d. If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable.
- e. All signatures shall be properly witnessed.
- f. If the contractor's license of a bidder is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the proposal. The title "Licensee" shall appear under his/her signature.

Proposals should be addressed as indicated in the Advertisement for Bids and be delivered, enclosed in an opaque sealed envelope, marked "Proposal" and bearing the title of the work, name of the bidder, and the contractor's license number of the bidder. Bidders should clearly mark on the outside of the bid envelope which contract(s) they are bidding.

Bidder shall identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts or an affidavit indicating work under contract will be self-performed, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f). Failure to comply with these requirements is grounds for rejection of the bid.

For projects bid in the single-prime alternative, the names and license numbers of major subcontractors shall be listed on the proposal form.

It shall be the specific responsibility of the bidder to deliver his bid to the proper official at the selected place and prior to the announced time for the opening of bids. Later delivery of a bid for any reason, including delivery by any delivery service, shall disqualify the bid.

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the contractor's cost involved in the work. See General Conditions, Article 19c-1.

2. EXAMINATION OF CONDITIONS

It is understood and mutually agreed that by submitting a bid the bidder acknowledges that he has carefully examined all documents pertaining to the work, the location, accessibility and general character of the site of the work and all existing buildings and structures within and adjacent to the site, and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, the character, quality and quantity of the material to be encountered, the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the work, the general and local conditions, the construction hazards, and all other matters, including, but not limited to, the labor situation which can in any way affect the work under the contract, and including all safety measures required by the Occupational Safety and Health Act of 1970 and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a proposal the bidder acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications and other contract documents for the construction of the work and that he accepts all the terms, conditions and stipulations contained therein; and that he is prepared to work in cooperation with other contractors performing work on the site.

Reference is made to contract documents for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by the designer in preparing the documents. The owner will make copies of all such surveys and reports available to the bidder upon request.

Each bidder may, at his own expense, make such additional surveys and investigations as he may deem necessary to determine his bid price for the performance of the work. Any on-site investigation shall be done at the convenience of the owner. Any reasonable request for access to the site will be honored by the owner.

3. BULLETINS AND ADDENDA

Any addenda to specifications issued during the time of bidding are to be considered covered in the proposal and in closing a contract they will become a part thereof. It shall be the bidder's responsibility to ascertain prior to bid time the addenda issued and to see that his bid includes any changes thereby required.

Should the bidder find discrepancies in, or omission from, the drawings or documents or should he be in doubt as to their meaning, he shall at once notify the designer who will send written instructions in the form of addenda to all bidders. Notification should be no later than seven (7) days prior to the date set for receipt of bids. Neither the owner nor the designer will be responsible for any oral instructions.

All addenda should be acknowledged by the bidder(s) on the Form of Proposal. However, even if not acknowledged, by submitting a bid, the bidder has certified that he has reviewed all issued addenda and has included all costs associated within his bid.

4. BID SECURITY

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a bid bond in an amount equal to not less than five percent (5%) of the proposal, said deposit to be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten (10) days after the award or to give satisfactory surety as required by law (G.S. 143-129).

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract. The owner may retain bid securities of any bidder(s) who may have a reasonable chance of award of contract for the full duration of time stated in the Notice to Bidders. Other bid securities may be released sooner, at the discretion of the owner. All bid securities (cash or certified checks) shall be returned to the bidders promptly after award of contracts, and no later than seven (7) days after expiration of the holding period stated in the Notice to Bidders. Standard Form of Bid Bond is included in these specifications and shall be used.

5. RECEIPT OF BIDS

Bids shall be received in strict accordance with requirements of the General Statutes of North Carolina. Bid security shall be required as prescribed by statute. Prior to the closing of the bid, the bidder will be permitted to change or withdraw his bid. Guidelines for opening of public construction bids are available from the State Construction Office.

6. OPENING OF BIDS

Upon opening, all bids shall be read aloud. Once bidding is closed, there shall not be any withdrawal of bids by any bidder and no bids may be returned by the designer to any bidder. After the opening of bids, no bid may be withdrawn, except under the provisions of General Statute 143-129.1, for a period of thirty days unless otherwise specified. Should the successful bidder default and fail to execute a contract, the contract may be awarded to the next lowest and responsible bidder. The owner reserves the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

- a. If the Form of Proposal furnished to the bidder is not used or is altered.
- b. If the bidder fails to insert a price for all bid items, alternate and unit prices requested.
- c. If the bidder adds any provisions reserving the right to accept or reject any award.
- d. If there are unauthorized additions or conditional bids, or irregularities of any kind which tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.
- e. If the bidder fails to complete the proposal form where information is requested so the bid may be properly evaluated by the owner.
- f. If the unit prices contained in the bid schedule are unacceptable to the owner and the State Construction Office.
- g. If the bidder fails to comply with other instructions stated herein.

7. BID EVALUATION

The award of the contract will be made to the lowest responsible bidder as soon as practical. The owner may award on the basis of the base bid and any alternates the owner chooses.

Before awarding a contract, the owner may require the apparent low bidder to qualify himself to be a responsible bidder by furnishing any or all of the following data:

- a. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the owner.
- b. A listing of completed projects of similar size.
- c. Permanent name and address of place of business.
- d. The number of regular employees of the organization and length of time the organization has been in business under present name.
- e. The name and home office address of the surety proposed and the name and address of the responsible local claim agent.
- f. The names of members of the firms who hold appropriate trade licenses, together with license numbers.
- g. If prequalified, contractor info will be reviewed and evaluated comparatively to submitted prequalification package.

Failure or refusal to furnish any of the above information, if requested, shall constitute a basis for disqualification of any bidder.

In determining the lowest responsible, responsive bidder, the owner shall take into consideration the bidder's compliance with the requirements of G.S. 143-128.2(c), the past performance of the bidder on construction contracts for the State with particular concern given to completion times, quality of work, cooperation with other contractors, and cooperation with the designer and owner. Failure of the low bidder to furnish affidavit and/or documentation as required by G.S. 143-128.2(c) shall constitute a basis for disqualification of the bid.

Should the owner adjudge that the apparent low bidder is not the lowest responsible, responsive bidder by virtue of the above information, said apparent low bidder will be so notified and his bid security shall be returned to him.

8. PERFORMANCE BOND

The successful bidder, upon award of contract, shall furnish a performance bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

9. PAYMENT BOND

The successful bidder, upon award of contract, shall furnish a payment bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

10. PAYMENTS

Payments to the successful bidders (contractors) will be made on the basis of monthly estimates. See Article 31, General Conditions.

11. PRE-BID CONFERENCE

Prior to the date set for receiving bids, the Designer may arrange and conduct a Pre-Bid Conference for all prospective bidders. The purpose of this conference is to review project requirements and to respond to questions from prospective bidders and their subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective bidders shall be as required by the "Notice to Bidders".

12. SUBSTITUTIONS

In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until ten (10) days prior to the receipt of bids when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change order.

Submittals for proposed substitutions shall include the following information:

- a. Name, address, and telephone number of manufacturer and supplier as appropriate.
- b. Trade name, model or catalog designation.
- c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.
- d. Detailed comparison with specified products including performance capabilities, warranties, and test results.
- e. Other pertinent data including data requested by the Designer to confirm product equality.

If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified, all bidders of record will be notified by Addendum.

GENERAL CONDITIONS OF THE CONTRACT

The use or reproduction of this document or any part thereof is authorized for and limited to use on projects of the State of North Carolina, and is distributed by, through and at the discretion of the State Construction Office, Raleigh, North Carolina, for that distinct and sole purpose.

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ARTICLE 1 - DEFINITIONS

- a. The **contract documents** consist of the Notice to Bidders; Instructions to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the proposal; the contract; the performance bond; the payment bond; insurance certificates; the approval of the attorney general; and the certificate of the Office of State Budget and Management. All of these items together form the contract.
- b. The **owner** is the State of North Carolina through the agency named in the contract.
- c. The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.
- d. The **contractor**, as referred to hereinafter, shall be deemed to be either of the several contracting parties called the "Party of the First Part" in either of the several contracts in connection with the total project. Where, in special instances hereinafter, a particular contractor is intended, an adjective precedes the word "contractor," as "general," "heating," etc. For the purposes of a single prime contract, the term Contractor shall be deemed to be the single contracting entity identified as the "Party of the First Part" in the single Construction Contract. Any references or adjectives that name or infer multiple prime contractors shall be interpreted to mean the single prime Contractor.
- e. A **subcontractor**, as the term is used herein, shall be understood to be one who has entered into a direct contract with a contractor, and includes one who furnishes materials worked to a special design in accordance with plans and specifications covered by the contract, but does not include one who only sells or furnishes materials not requiring work so described or detailed.
- f. **Written notice** shall be defined as notice in writing delivered in person to the contractor, or to a partner of the firm in the case of a partnership, or to a member of the contracting organization, or to an officer of the organization in the case of a corporation, or sent to the last known business address of the contracting organization by registered mail.
- g. **Work**, as used herein as a noun, is intended to include materials, labor, and workmanship of the appropriate contractor.
- h. The **project** is the total construction work to be performed under the contract documents by the several contractors.
- i. **Project Expediter**, as used herein, is an entity stated in the contract documents, designated to effectively facilitate scheduling and coordination of work activities. See Article 14(f) for responsibilities of a Project Expediter. **For the purposes of a single prime contract, the single prime contractor shall be designated as the Project Expediter.**
- j. **Change order**, as used herein, shall mean a written order to the contractor subsequent to the signing of the contract authorizing a change in the contract. The change order shall be signed by the contractor, designer and the owner, and approved by the State Construction Office, in that order (Article 19).

- k. **Field Order**, as used herein, shall mean a written approval for the contractor to proceed with the work requested by owner prior to issuance of a formal Change Order. The field order shall be signed by the contractor, designer, owner, and State Construction Office.
- l. **Time of completion**, as stated in the contract documents, is to be interpreted as consecutive calendar days measured from the date established in the written Notice to Proceed, or such other date as may be established herein (Article 23).
- m. **Liquidated damages**, as stated in the contract documents [, is an amount reasonably estimated in advance to cover the consequential damages associated with the Owner's economic loss in not being able to use the Project for its intended purposes at the end of the contract's completion date as amended by change order, if any, by reason of failure of the contractor(s) to complete the work within the time specified. Liquidated damages does not include the Owner's extended contract administration costs (including but not limited to additional fees for architectural and engineering services, testing services, inspection services, commissioning services, etc.), such other damages directly resulting from delays caused solely by the contractor, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused solely by the Contractor (e.g., if a multi-phased project-subsequent phases, delays in start other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).
- n. **Surety**, as used herein, shall mean the bonding company or corporate body which is bound with and for the contractor, and which engages to be responsible for the contractor and his acceptable performance of the work.
- o. **Routine written communications between the Designer and the Contractor** are any communication other than a "request for information" provided in letter, memo, or transmittal format, sent by mail, courier, electronic mail, or facsimile. Such communications can not be identified as "request for information".
- p. **Clarification or Request for information (RFI)** is a request from the Contractor seeking an interpretation or clarification by the Designer relative to the contract documents. The RFI, which shall be labeled (RFI), shall clearly and concisely set forth the issue or item requiring clarification or interpretation and why the response is needed. The RFI must set forth the Contractor's interpretation or understanding of the contract documents requirements in question, along with reasons for such an understanding.
- q. **Approval** means written or imprinted acknowledgement that materials, equipment or methods of construction are acceptable for use in the work.
- r. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.
- s. **"Equal to" or "approved equal"** shall mean materials, products, equipment, assemblies, or installation methods considered equal by the bidder in all characteristics (physical, functional, and aesthetic) to those specified in the contract documents. Acceptance of equal is subject to approval of Designer and owner.
- t. **"Substitution" or "substitute"** shall mean materials, products, equipment, assemblies, or installation methods deviating in at least one characteristic (physical, functional, or aesthetic) from those specified, but which in the opinion of the bidder would improve competition and/or enhance the finished installation. Acceptance of substitution is subject to the approval of the Designer and owner.

- u. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.
- v. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.
- w. **Special inspector** is one who inspects materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the approved construction documents and referenced standards.
- x. **Commissioning** is a quality assurance process that verifies and documents that building components and systems operate in accordance to the owner's project requirements and the project design documents.
- y. **Designer Final Inspection** is the inspection performed by the design team to determine the completeness of the project in accordance with approved plans and specifications. This inspection occurs prior to SCO final inspection.
- z. **SCO Final Inspection** is the inspection performed by the State Construction Office to determine the completeness of the project in accordance with NC Building Codes and approved plans and specifications.
- aa. **Beneficial Occupancy** is requested by the owner and is occupancy or partial occupancy of the building after all life safety items have been completed as determined by the State Construction Office. Life safety items include but not limited to fire alarm, sprinkler, egress and exit lighting, fire rated walls, egress paths and security.
- bb. Final Acceptance is the date in which the State Construction Office accepts the construction as totally complete. This includes the SCO Final Inspection and certification by the designer that all punch lists are completed.

ARTICLE 2 - INTENT AND EXECUTION OF DOCUMENTS

- a. The drawings and specifications are complementary, one to the other, and that which is shown on the drawings or called for in the specifications shall be as binding as if it were both called for and shown. The intent of the drawings and specifications is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a bid for a complete job. In case of discrepancy or disagreement in the contract documents, the order of precedence shall be: Form of Contract, specifications, large-scale detail drawings, small-scale drawings.
- b. The wording of the specifications shall be interpreted in accordance with common usage of the language except that words having a commonly used technical or trade meaning shall be so interpreted in preference to other meanings.
- c. The contractor shall execute each copy of the proposal, contract, performance bond and payment bond as follows:
 - 1. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.
 - 2. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.

3. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.
4. If the documents are made by a joint venture, they shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable to each particular member.
5. All signatures shall be properly witnessed.
6. If the contractor's license is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the contract. The title "Licensee" shall appear under his/her signature.
7. The bonds shall be executed by an attorney-in-fact. There shall be attached to each copy of the bond a certified copy of power of attorney properly executed and dated.
8. Each copy of the bonds shall be countersigned by an authorized individual agent of the bonding company licensed to do business in North Carolina. The title "Licensed Resident Agent" shall appear after the signature.
9. The seal of the bonding company shall be impressed on each signature page of the bonds.
10. The contractor's signature on the performance bond and the payment bond shall correspond with that on the contract. The date of performance and payment bond shall not be prior to the date of the contract.

ARTICLE 3 - CLARIFICATIONS AND DETAIL DRAWINGS

- a. In such cases where the nature of the work requires clarification by the designer, such clarification shall be furnished by the designer with reasonable promptness by means of written instructions or detail drawings, or both. Clarifications and drawings shall be consistent with the intent of contract documents, and shall become a part thereof.
- b. The contractor(s) and the designer shall prepare, if deemed necessary, a schedule fixing dates upon which foreseeable clarifications will be required. The schedule will be subject to addition or change in accordance with progress of the work. The designer shall furnish drawings or clarifications in accordance with that schedule. The contractor shall not proceed with the work without such detail drawings and/or written clarifications.

ARTICLE 4 - COPIES OF DRAWINGS AND SPECIFICATIONS

The designer or Owner shall furnish free of charge to the contractors electronic copies of plans and specifications. If requested by the contractor, paper copies of plans and specifications shall be furnished free of charge as follows:

- a. General contractor - Up to twelve (12) sets of general contractor drawings and specifications, up to six (6) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

- b. Each other contractor - Up to six (6) sets of the appropriate drawings and specifications, up to three (3) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.
- c. Additional sets shall be furnished at cost, including mailing, to the contractor upon request by the contractor. This cost shall be stated in the bidding documents.
- d. For the purposes of a single-prime contract, the contractor shall receive up to 30 sets of drawings and specifications, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA

- a. Within 15 consecutive calendar days after the notice to proceed, each prime contractor shall submit a schedule for submission of all shop drawings, product data, samples, and similar submittals through the Project Expediter to the Designer. This schedule shall indicate the items, relevant specification sections, other related submittal, data, and the date when these items will be furnished to the designer.
- b. The Contractor(s) shall review, approve and submit to the Designer all Shop Drawings, Coordination Drawings, Product Data, Samples, Color Charts, and similar submittal data required or reasonably implied by the Contract Documents. Required Submittals shall bear the Contractor's stamp of approval, any exceptions to the Contract Documents shall be noted on the submittals, and copies of all submittals shall be of sufficient quantity for the Designer to retain up to three (3) copies of each submittal for his own use plus additional copies as may be required by the Contractor. Submittals shall be presented to the Designer in accordance with the schedule submitted in paragraph (a). so as to cause no delay in the activities of the Owner or of separate Contractors.
- c. The Designer shall review required submittals promptly, noting desired corrections if any, and retaining three (3) copies (1 for the Designer, 1 for the owner and 1 for SCO) for his use. The remaining copies of each submittal shall be returned to the Contractor not later than twenty (20) days from the date of receipt by the Designer, for the Contractor's use or for corrections and resubmittal as noted by the Designer. When resubmittals are required, the submittal procedure shall be the same as for the original submittals.
- d. Approval of shop drawings/submittals by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with the design or terms of the contract documents nor from responsibility of errors of any sort in the shop drawings, unless such lack of compliance or errors first have been called in writing to the attention of the Designer by the Contractor.

ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

- a. The contractor shall maintain, in readable condition at his job office, one complete set of working drawings and specifications for his work including all shop drawings. Such drawings and specifications shall be available for use by the designer, his authorized representative, owner or State Construction Office.

- b. The contractor shall maintain at the job office, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings by the contractor and submitted to the designer upon project completion and no later than 30 days after final acceptance of the project.
- c. The contractor shall maintain at the job office a record of all required tests that have been performed, clearly indicating the scope of work inspected and the date of approval or rejection.

ARTICLE 7 - OWNERSHIP OF DRAWINGS AND SPECIFICATIONS

All drawings and specifications are instruments of service and remain the property of the owner. The use of these instruments on work other than this contract without permission of the owner is prohibited. All copies of drawings and specifications other than contract copies shall be returned to the owner upon request after completion of the work.

ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES

- a. The contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied therefrom, all in accordance with the contract documents.
- b. All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.
- c. Upon notice, the contractor shall furnish evidence as to quality of materials.
- d. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Request for substitution of materials, items, or equipment shall be submitted to the designer for approval or disapproval; such approval or disapproval shall be made by the designer prior to the opening of bids. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and owner approves.
- e. The designer is the judge of equality for proposed substitution of products, materials or equipment.

- g. If at any time during the construction and completion of the work covered by these contract documents, the language, conduct, or attire of any workman of the various crafts be adjudged a nuisance to the owner or designer, or if any workman be considered detrimental to the work, the contractor shall order such parties removed immediately from grounds.

ARTICLE 9 - ROYALTIES, LICENSES AND PATENTS

It is the intention of the contract documents that the work covered herein will not constitute in any way infringement of any patent whatsoever unless the fact of such patent is clearly evidenced herein. The contractor shall protect and save harmless the owner against suit on account of alleged or actual infringement. The contractor shall pay all royalties and/or license fees required on account of patented articles or processes, whether the patent rights are evidenced hereinafter.

ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS

- a. The contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the designer in writing. See Instructions to Bidders, Paragraph 3, Bulletins and Addenda. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the designer, he shall bear all cost arising therefrom. Additional requirements implemented after bidding will be subject to equitable negotiations.
- b. All work under this contract shall conform to the North Carolina State Building Code and other State, local and national codes as are applicable. The cost of all required inspections and permits shall be the responsibility of the contractor and included within the bid proposal. All water taps, meter barrels, vaults and impact fees shall be paid by the contractor unless otherwise noted.
- d. Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to inspection by any county or municipal authorities and are not subject to county or municipal building codes. The contractor shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.
- e. Projects involving local funding (community colleges) are subject also to county and municipal building codes and inspection by local authorities. The contractor shall pay the cost of these permits and inspections.

ARTICLE 11 - PROTECTION OF WORK, PROPERTY AND THE PUBLIC

- a. The contractors shall be jointly responsible for the entire site and the building or construction of the same and provide all the necessary protections, as required by the owner or designer, and by laws or ordinances governing such conditions. They shall be responsible for any damage to the owner's property, or of that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any damages caused to the owner. All contractors shall have access to the project at all times.
- b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.
- c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the designer and owner.
- d. The contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around same. He shall barricade all walks, roads, etc., as directed by the designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.
- e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.
- f. The contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.
- g. The contractor shall designate a responsible person of his organization as safety officer/inspector to inspect the project site for unsafe health and safety hazards, to report these hazards to the contractor for correction, and whose duties also include accident prevention on the project, and to provide other safety and health measures on the project site as required by the terms and conditions of the contract. The name of the safety inspector shall be made known to the designer and owner at the time of the preconstruction conference and in all cases prior to any work starting on the project.
- h. In the event of emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage.

Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 19(b).

- i. Any and all costs associated with correcting damage caused to adjacent properties of the construction site or staging area shall be borne by the contractor. These costs shall include but not be limited to flooding, mud, sand, stone, debris, and discharging of waste products.

ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973

- a. Any land-disturbing activity performed by the contractor(s) in connection with the project shall comply with all erosion control measures set forth in the contract documents and any additional measures which may be required in order to ensure that the project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15, North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 N.C.A.C. 4A, 4B and 4C).
- b. Upon receipt of notice that a land-disturbing activity is in violation of said act, the contractor(s) shall be responsible for ensuring that all steps or actions necessary to bring the project in compliance with said act are promptly taken.
- c. The contractor(s) shall be responsible for defending any legal actions instituted pursuant to N.C.G.S. 113A-64 against any party or persons described in this article.
- d. To the fullest extent permitted by law, the contractor(s) shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, civil penalties, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance of work or failure of performance of work, provided that any such claim, damage, civil penalty, loss or expense is attributable to a violation of the Sedimentation Pollution Control Act. Such obligation shall not be construed to negate, abridge or otherwise reduced any other right or obligation of indemnity which would otherwise exist as to any party or persons described in this article.

ARTICLE 13 - INSPECTION OF THE WORK

- a. It is a condition of this contract that the work shall be subject to inspection during normal working hours and during any time work is in preparation and progress by the designer, designated official representatives of the owner, State Construction Office and those persons required by state law to test special work for official approval. The contractor shall therefore provide safe access to the work at all times for such inspections.
- b. All instructions to the contractor will be made only by or through the designer or his designated project representative. Observations made by official representatives of the owner shall be conveyed to the designer for review and coordination prior to issuance to the contractor.
- c. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. Contractor shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first reinspection all costs associated with additional reinspections shall be borne by the contractor.

- d. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the contractor shall give adequate notice to the designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the designer. Such special tests or inspections will be made in the presence of the designer, or his authorized representative, and it shall be the contractor's responsibility to serve ample notice of such tests.
- e. All laboratory tests shall be paid by the owner unless provided otherwise in the contract documents except the general contractor shall pay for laboratory tests to establish design mix for concrete, and for additional tests to prove compliance with contract documents where materials have tested deficient except when the testing laboratory did not follow the appropriate ASTM testing procedures.
- f. Should any work be covered up or concealed prior to inspection and approval by the designer, special inspector, and/or State Construction Office such work shall be uncovered or exposed for inspection, if so requested by the designer in writing. Inspection of the work will be made upon notice from the contractor. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition, the work that has been covered or concealed will be paid by the contractor involved.

ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE

- a. Throughout the progress of the work, each contractor shall keep at the job site, a competent superintendent and supervisory staff satisfactory to the designer and the owner. The superintendent and supervisory staff shall not be changed without the consent of the designer and owner unless said superintendent ceases to be employed by the contractor or ceases to be competent as determined by the contractor, designer or owner. The superintendent and other staff designated by the contractor in writing shall have authority to act on behalf of the contractor, and instructions, directions or notices given to him shall be as binding as if given to the contractor. However, directions, instructions, and notices shall be confirmed in writing.
- b. The contractor shall examine and study the drawings and specifications and fully understand the project design, and shall provide constant and efficient supervision to the work. Should he discover any discrepancies of any sort in the drawings or specifications, he shall report them to the designer without delay. He will not be held responsible for discrepancies in the drawings and/or specifications, but shall be held responsible to report them should they become known to him.
- c. All contractors shall be required to cooperate and consult with each other during the construction of this project. Prior to installation of work, all contractors shall jointly prepare coordination drawings, showing locations of various ductworks, piping, motors, pumps, and other mechanical or electrical equipment, in relation to the structure, walls and ceilings. These drawings shall be submitted to the designer through the Project Expediter for information only. Each contractor shall lay out and execute his work to cause the least delay to other contractors. Each contractor shall be financially responsible for any damage to other contractor's work and for undue delay caused to other contractors on the project.
- d. The contractor is required to attend job site progress conferences as called by the designer. The contractor shall be represented at these job progress conferences by both home office and project personnel. These representatives shall have authority to act on behalf of the contractor. These meetings shall be open to subcontractors, material

suppliers and any others who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the project on schedule and to complete the project within the specified contract time. Each contractor shall be prepared to assess progress of the work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The designer or his authorized representative shall be the coordinator of the conferences and shall preside as chairman. The contractor shall turn over a copy of his daily reports to the Designer and Owner at the job site progress conference. Owner will determine daily report format.

- e The contractor(s) shall, employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a bench mark in a location where same will not be disturbed and where direct instruments sights may be taken.
- f. The designer shall designate a Project Expediter on projects involving two or more prime contracts. The Project Expediter shall be designated in the Supplementary General Conditions. The Project Expediter shall have at a minimum the following responsibilities.
 - 1. Prepare the project construction schedule and shall allow all prime contractors (multi-prime contract) and subcontractors (single-prime contract) performing general, plumbing, HVAC, and electrical work equal input into the preparation of the initial construction schedule.
 - 2. Maintain a project progress schedule for all contractors.
 - 3. Give adequate notice to all contractors to ensure efficient continuity of all phases of the work.
 - 4. Notify the designer of any changes in the project schedule.
 - 5. Recommend to the owner whether payment to a contractor shall be approved.
- g. It shall be the responsibility of the Project Expediter to cooperate with and obtain from several prime contractors and subcontractors on the job, their respective work activities and integrate these activities into a project construction schedule in form of a detailed bar chart or Critical Path Method (CPM), schedule. Each prime contractor shall provide work activities within fourteen (14) days of request by the Project Expediter. A “work activity”, for scheduling purposes, shall be any component or contractual requirement of the project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill. The project construction schedule shall graphically show all salient features of the work required to construct the project from start to finish and within the allotted time established in the contract. The time (in days) between the contractor’s early completion and contractual completion dates is part of the project total float time; and shall be used as such, unless amended by a change order. On a multi-prime project, each prime contractor shall review the proposed construction schedule and approve same in writing. The Project Expediter shall submit the proposed construction schedule to the designer for comments. The complete Project construction schedule shall be of the type set forth in the Supplementary General Condition or subparagraph (1) or (2) below, as appropriate:

1. For a project with total contracts of \$500,000 or less, a bar chart schedule will satisfy the above requirement. The schedule shall indicate the estimated starting and completion dates for each major element of the work.
2. For a project with total contracts over \$500,000, a Critical Path Method (CPM) schedule shall be utilized to control the planning and scheduling of the Work. The CPM schedule shall be the responsibility of the Project Expediter and shall be paid for by the Project Expediter.

Bar Chart Schedule: Where a bar chart schedule is required, it shall be time-scaled in weekly increments, shall indicate the estimated starting and completion dates for each major element of the work by trade and by area, level, or zone, and shall schedule dates for all salient features, including but not limited to the placing of orders for materials, submission of shop drawings and other Submittals for approval, approval of shop drawings by designers, the manufacture and delivery of material, the testing and the installation of materials, supplies and equipment, and all Work activities to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s). Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

CPM Schedule: Where a CPM schedule is required, it shall be in time-scaled precedence format using the Project Expediter's logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the work to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s).. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall not be considered for the exclusive use or benefit of either the Owner or the Contractor, but must be allocated in the best interest of completing the Work within the Contract time. Extensions to the Contract time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. On contracts with a price over \$2,500,000, the CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.

Early Completion of Project: The Contractor may attempt to complete the project prior to the Contract Completion Date. However, such planned early completion shall be for the Contractor's convenience only and shall not create any additional rights of the Contractor or obligations of the Owner under this Contract, nor shall it change the Time

for Completion or the Contract Completion Date. The Contractor shall not be required to pay liquidated damages to the Owner because of its failure to complete by its planned earlier date. Likewise, the Owner shall not pay the Contractor any additional compensation for early completion nor will the Owner owe the Contractor any compensation should the Owner, its officers, employees, or agents cause the Contractor not to complete earlier than the date required by the Contract Documents.

- h. The proposed project construction schedule shall be presented to the designer no later than fifteen (15) days after written notice to proceed. No application for payment will be processed until this schedule is accepted by the designer and owner.
- i. The approved project construction schedule shall be distributed to all contractors and displayed at the job site by the Project Expediter.
- j. The several contractors shall be responsible for their work activities and shall notify the Project Expediter of any necessary changes or adjustments to their work. The Project Expediter shall maintain the project construction schedule, making biweekly adjustments, updates, corrections, etc., that are necessary to finish the project within the Contract time, keeping all contractors and the designer fully informed. Copy of a bar chart schedule annotated to show the current progress shall be submitted by the Contractor(s) to the designer, along with monthly request for payment. For project requiring CPM schedule, the Contractor shall submit a biweekly report of the status of all activities. The bar chart schedule or status report shall show the actual Work completed to date in comparison with the original Work scheduled for all activities. If any activities of the work of several contractors are behind schedule, the contractor must indicate in writing, what measures will be taken to bring each such activity back on schedule and to ensure that the Contract Completion Date is not exceeded. A plan of action and recovery schedule shall be developed and submitted to the designer by the Project Expediter, when (1) the contractor's report indicates delays, that are in the opinion of the designer or the owner, of sufficient magnitude that the contractor's ability to complete the work by the scheduled completion is brought into question; (2) the updated construction schedule is thirty (30) days behind the planned or baseline schedule and no legitimate time extensions, as determined by the Designer, are in process; and (3) the contractor desires to make changes in the logic (sequencing of work) or the planned duration of future activities of the CPM schedule which, in the opinion of the designer or the owner, are of a major nature. The plan of action, when required shall be submitted to the Owner for review within two (2) business days of the Contractor receiving the Owner's written demand. The recovery schedule, when required, shall be submitted to the Owner within five (5) calendar days of the Contractor's receiving the Owner's written demand. Failure to provide an updated construction schedule or a recovery schedule may be grounds for rejection of payment applications or withholding of funds as set forth in Article 33.
- k. The Project Expediter shall notify each contractor of such events or time frames that are critical to the progress of the job. Such notice shall be timely and reasonable. Should the progress be delayed due to the work of any of the several contractors, it shall be the duty of the Project Expediter to immediately notify the contractor(s) responsible for such delay, the designer, the State Construction Office and other prime contractors. The designer shall determine the contractor(s) who caused the delays and notify the bonding company of the responsible contractor(s) of the delays; and shall make a recommendation to the owner regarding further action.
- l. Designation as Project Expediter entails an additional project control responsibility and does not alter in any way the responsibility of the contractor so designated, nor the

responsibility of the other contractors involved in the project. The project expeditor's Superintendent(s) shall be in attendance at the Project site at all times when work is in progress unless conditions are beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. It is understood that such Superintendent shall be acceptable to the Owner and Designer and shall be the one who will be continued in that capacity for the duration of the project unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The Superintendent shall not be employed on any other project for or by the Contractor or by any other entity during the course of the Work. If the Superintendent is employed by the Contractor on another project without the Owner's approval, then the Owner may deduct from the Contractor's monthly general condition costs and amount representing the Superintendent's cost and shall deduct that amount for each month thereafter until the Contractor has the Superintendent back on the Owner's Project full-time.

ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

- a. Effective from January 1, 2002, Chapter 143, Article 8, was amended, to allow public contracts to be delivered by the following delivery methods: single-prime, dual (single-prime and separate-prime), construction manager at risk, and alternative contracting method as approved by the State Building Commission. The owner reserves the right to prepare separate specifications, receive separate bids, and award separate contracts for such other major items of work as may be in the best interest of the State. For the purposes of a single prime contract, refer to Article 1 – Definitions.
- b. All contractors shall cooperate with each other in the execution of their work, and shall plan their work in such manner as to avoid conflicting schedules or delay of the work. See Article 14, Construction Supervision.
- c. If any part of contractor's work depends upon the work of another contractor, defects which may affect that work shall be reported to the designer in order that prompt inspection may be made and the defects corrected. Commencement of work by a contractor where such condition exists will constitute acceptance of the other contractor's work as being satisfactory in all respects to receive the work commenced, except as to defects which may later develop. The designer shall be the judge as to the quality of work and shall settle all disputes on the matter between contractors.
- d. Any mechanical or electrical work such as sleeves, inserts, chases, openings, penetrations, etc., which is located in the work of the general contractor shall be built in by the general contractor. The respective mechanical and electrical contractors shall set all sleeves, inserts and other devices that are to be incorporated into the structure in cooperation and under the supervision of the general contractor. The responsibility for the exact location of such items shall be that of the mechanical and/or electrical contractor.
- e. The designer and the owner shall have access to the work whenever it is in preparation and progress and during normal working hours. The contractor shall provide facilities for such access so the designer may perform his functions under the contract documents.
- f. Should a contractor cause damage to the work or property of another contractor, he shall be directly responsible, and upon notice, shall promptly settle the claim or otherwise resolve the dispute.

ARTICLE 16 - SUBCONTRACTS AND SUBCONTRACTORS

- a. Within thirty (30) days after award of the contract, the contractor shall submit to the designer, owner and to the State Construction Office a list giving the names and addresses of subcontractors and equipment and material suppliers he proposes to use, together with the scope of their respective parts of the work. Should any subcontractor be disapproved by the designer or owner, the designer or owner shall submit his reasons for disapproval in writing to the State Construction Office for its consideration with a copy to the contractor. If the State Construction Office concurs with the designer's or owner's recommendation, the contractor shall submit a substitute for approval. The designer and owner shall act promptly in the approval of subcontractors, and when approval of the list is given, no changes of subcontractors will be permitted except for cause or reason considered justifiable by the designer or owner.
- b. The designer will furnish to any subcontractor, upon request, evidence regarding amounts of money paid to the contractor on account of the subcontractor's work.
- c. The contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The contractor agrees that no contractual relationship exists between the subcontractor and the owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the contractor.
- d. The owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

ARTICLE 17 - CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

The contractor agrees that the terms of these contract documents shall apply equally to each subcontractor as to the contractor, and the contractor agrees to take such action as may be necessary to bind each subcontractor to these terms. The contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to contractor-subcontractor relationships, and that payments to subcontractors shall be made in accordance with the provisions of G.S. 143-134.1 titled Interest on final payments due to prime contractors: payments to subcontractors.

- a. On all public construction contracts which are let by a board or governing body of the state government or any political subdivision thereof, except contracts let by the Department of Transportation pursuant to G.S. 136-28.1, the balance due prime contractors shall be paid in full within 45 days after respective prime contracts of the project have been accepted by the owner, certified by the architect, engineer or designer to be completed in accordance with terms of the plans and specifications, or occupied by the owner and used for the purpose for which the project was constructed, whichever occurs first. Provided, however, that whenever the architect or consulting engineer in charge of the project determines that delay in completion of the project in accordance with terms of the plans and specifications is the fault of the contractor, the project may be occupied and used for the purposes for which it was constructed without payment of any interest on amounts withheld past the 45 day limit. No payment shall be delayed because of the failure of another prime contractor on such project to complete his contract. Should final payment to any prime contractor beyond the date such contracts have been certified to be completed by the designer or architect, accepted by the owner, or occupied by the owner and used for the purposes for which the project was constructed, be delayed by more than 45 days, said prime contractor shall be paid interest, beginning on the 46th day, at the rate of one percent (1%) per month or fraction thereof unless a lower rate is

agreed upon on such unpaid balance as may be due. In addition to the above final payment provisions, periodic payments due a prime contractor during construction shall be paid in accordance with the payment provisions of the contract documents or said prime contractor shall be paid interest on any such unpaid amount at the rate stipulated above for delayed final payments. Such interest shall begin on the date the payment is due and continue until the date on which payment is made. Such due date may be established by the terms of the contract. Funds for payment of such interest on state-owned projects shall be obtained from the current budget of the owning department, institution or agency. Where a conditional acceptance of a contract exists, and where the owner is retaining a reasonable sum pending correction of such conditions, interest on such reasonable sum shall not apply.

- b. Within seven days of receipt by the prime contractor of each periodic or final payment, the prime contractor shall pay the subcontractor based on work completed or service provided under the subcontract. Should any periodic or final payment to the subcontractor be delayed by more than seven days after receipt of periodic or final payment by the prime contractor, the prime contractor shall pay the subcontractor interest, beginning on the eighth day, at the rate of one percent (1%) per month or fraction thereof on such unpaid balance as may be due.
- c. The percentage of retainage on payments made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the owner to the prime contractor. Any percentage of retainage on payments made by the prime contractor to the subcontractor that exceeds the percentage of retainage on payments made by the owner to the prime contractor shall be subject to interest to be paid by the prime contractor to the subcontractor at the rate of one percent (1%) per month or fraction thereof.
- d. Nothing in this section shall prevent the prime contractor at the time of application and certification to the owner from withholding application and certification to the owner for payment to the subcontractor for unsatisfactory job progress; defective construction not remedied; disputed work; third-party claims filed or reasonable evidence that claim will be filed; failure of subcontractor to make timely payments for labor, equipment and materials; damage to prime contractor or another subcontractor; reasonable evidence that subcontract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by owner.

ARTICLE 18 - DESIGNER'S STATUS

- a. The designer shall provide general administration of the performance of construction contracts, including liaison and necessary inspection of the work to ensure compliance with plans and specifications. He is the agent of the owner only for the purpose of constructing this work and to the extent stipulated in the contract documents. He has authority to direct work to be performed, to stop work, to order work removed, or to order corrections of faulty work, where any such action by the designer may be necessary to assure successful completion of the work.
- b. The designer is the impartial interpreter of the contract documents, and, as such, he shall exercise his powers under the contract to enforce faithful performance by both the owner and the contractor, taking sides with neither.
- c. Should the designer cease to be employed on the work for any reason whatsoever, then the owner shall employ a competent replacement who shall assume the status of the former designer.

- d. The designer and his consultants will make inspections of the project. He will inspect the progress, the quality and the quantity of the work.
- e. The designer and the owner shall have access to the work whenever it is in preparation and progress during normal working hours. The contractor shall provide facilities for such access so the designer and owner may perform their functions under the contract documents.
- f. Based on the designer's inspections and evaluations of the project, the designer shall issue interpretations, directives and decisions as may be necessary to administer the project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the contract.

ARTICLE 19 - CHANGES IN THE WORK

- a. The owner may have changes made in the work covered by the contract. These changes will not invalidate and will not relieve or release the contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.
- b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order or written field order from the designer, countersigned by the owner and the state construction office authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed.

A field order, transmitted by fax, electronically, or hand delivered, may be used where the change involved impacts the critical path of the work. A formal change order shall be issued as expeditiously as possible.

In the event of emergency endangering life or property, the contractor may be directed to proceed on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the designer or owner, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the work the change order will be prepared as outlined under either Method "c(1)" or Method "c(2)" or both.

- c. In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:
 - 1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, Owner and State Construction Office the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except in such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to proceed under subparagraph c2 herein. If neither party elects to proceed under c2, then unit prices shall apply.
 - 2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

- d. Under Paragraph "b" and Methods "c(2)" above, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors (1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc)) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc contractors shall be allowed a maximum of 2.5% on the contracted work of their subs. ; Under Method "c(1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "c(2)" and Paragraph (b) above, the contractor shall include no less than five percent (5%) profit, but no allowances for overhead.
- e. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:
1. The actual costs of materials and supplies incorporated or consumed as part of the work;
 2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.
 3. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of 30 days per year; retirement contributions; worker's compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts; the total of which shall not exceed thirty percent (30%) of the actual costs of labor;
 4. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the work;
 5. The actual costs of premiums for bonds, insurance, permit fees, and sales or use taxes related to the work.
- Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the owner.
- f. Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined above.
- g. In all change orders, the procedure will be for the designer to request proposals for the change order work in writing. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor's accepted proposal including all supporting documentation required by the designer, the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to

the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature. The owner shall execute the change order and forward to the State Construction Office for final approval, within seven (7) days of receipt. The State Construction Office shall act on the change order within seven (7) days. In case of emergency or extenuating circumstances, approval of changes may be obtained verbally by telephone or field orders approved by all parties, then shall be substantiated in writing as outlined under normal procedure.

- h. At the time of signing a change order, the contractor shall be required to certify as follows:

"I certify that my bonding company will be notified forthwith that my contract has been changed by the amount of this change order, and that a copy of the approved change order will be mailed upon receipt by me to my surety."

- i. A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.
- j. If, during the progress of the work, the owner requests a change order and the contractor's terms are unacceptable, the owner, with the approval of the State Construction Office, may require the contractor to perform such work on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the Designer or owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph d. above and "net cost" and "cost" per paragraph e. above. Without prejudice, nothing in this paragraph shall preclude the owner from performing or to have performed that portion of the work requested in the change order.

ARTICLE 20 - CLAIMS FOR EXTRA COST

- a. Should the contractor consider that as a result of instructions given by the designer, he is entitled to extra cost above that stated in the contract, he shall give written notice thereof to the designer within seven (7) days without delay. The written notice shall clearly state that a claim for extra cost is being made and shall provide a detailed justification for the extra cost. The contractor shall not proceed with the work affected until further advised, except in emergency involving the safety of life or property, which condition is covered in Article 19(b) and Article 11(h). No claims for extra compensation shall be considered unless the claim is so made. The designer shall render a written decision within seven (7) days of receipt of claim.
- b. The contractor shall not act on instructions received by him from persons other than the designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The designer shall not be responsible for misunderstandings claimed by the contractor of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the contract documents unless such instruction is confirmed in writing and supported by a properly authorized change order.
- c. Should a claim for extra compensation that complies with the requirements of (a) above by the contractor and is denied by the designer or owner, and cannot be resolved by a

representative of the State Construction Office, the contractor may request a mediation in connection with GS 143-128(f1) in the dispute resolution rules adopted by the State Building Commission (1 N.C.A.C. 30H .0101 through .1001). If the contractor is unable to resolve its claim as a result of mediation, the contractor may pursue the claim in accordance with the provisions of G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner, and the following:

1. A contractor who has not completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The director may deny, allow or compromise the claim, in whole or in part. A claim under this subsection is not a contested case under Chapter 150B of the General Statutes.
2. (a) A contractor who has completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The claim shall be submitted within sixty (60) days after the contractor receives a final statement of the board's disposition of his claim and shall state the factual basis for the claim.
 - (b) The director shall investigate a submitted claim within ninety (90) days of receiving the claim, or within any longer time period upon which the director and the contractor agree. The contractor may appear before the director, either in person or through counsel, to present facts and arguments in support of his claim. The director may allow, deny or compromise the claim, in whole or in part. The director shall give the contractor a written statement of the director's decision on the contractor's claim.
 - (c) A contractor who is dissatisfied with the director's decision on a claim submitted under this subsection may commence a contested case on the claim under Chapter 150B of the General Statutes. The contested case shall be commenced within sixty (60) days of receiving the director's written statement of the decision.
 - (d) As to any portion of a claim that is denied by the director, the contractor may, in lieu of the procedures set forth in the preceding subsection of this section, within six (6) months of receipt of the director's final decision, institute a civil action for the sum he claims to be entitled to under the contract by filing a verified complaint and the issuance of a summons in the Superior Court of Wake County or in the superior court of any county where the work under the contract was performed. The procedure shall be the same as in all civil actions except that all issues shall be tried by the judge, without a jury.

ARTICLE 21 - MINOR CHANGES IN THE WORK

The designer will have the authority to order minor changes in the work not involving an adjustment in the contract sum or time for completion, and not inconsistent with the intent of the contract documents. Such changes shall be effected by written order, copied to the State Construction Office, and shall be binding on the owner and the contractor.

ARTICLE 22 - UNCORRECTED FAULTY WORK

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the owner and the designer, the owner shall be reimbursed by the contractor. A change order will be issued to reflect a reduction in the contract sum.

ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

- a. The time of completion is stated in the Supplementary General Conditions and in the Form of Construction Contract. The Project Expediter, upon notice of award of contract, shall prepare a construction schedule to complete the project within the time of completion as required by Article 14.
- b. The contractors shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the designer and shall fully complete all work hereunder within the time of completion stated. Time is of the essence and the contractor acknowledges the Owner will likely suffer financial damage for failure to complete the work within the time of completion. For each day in excess of the above number of days, the contractor(s) shall pay the owner the sum stated as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the owner by reason of failure of said contractor(s) to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof. Should the work be delayed by both the owner and contractor, liquidated damages shall be apportioned to reflect the delays of each party. In the case of concurrent delays, contractor caused delays shall be accounted for before owner and designer caused delays.
- c. In the event of multiple prime contractors, the designer shall be the judge as to the division of responsibility between the contractor(s), based on the construction schedule, weekly reports and job records, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them.
- d. If the contractor is delayed at any time in the progress of his work solely by any act or negligence of the owner, the designer, or by any employee of either; by any separate contractor employed by the owner; by changes ordered in the work; by labor disputes at the project site; by abnormal weather conditions not reasonably anticipated for the locality where the work is performed; by unavoidable casualties; by any causes beyond the contractor's control; or by any other causes which the designer and owner determine may justify the delay, then the contract time may be extended by change order only for the time which the designer and owner may determine is reasonable.

Time extensions will not be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the same time interval based on the National Oceanic and Atmospheric Administration National Weather Service statistics for the locality where work is performed and on daily weather logs kept on the job site by the contractor reflecting the effect of the weather on progress of the work and initialed by the designer's representative. No weather delays shall be considered after the building is dried in unless work claimed to be delayed is on the critical path of the baseline schedule or approved updated schedule. Time extensions for weather delays, acts of God, labor disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the owner or its agents. Contractor caused delays shall be accounted for before owner or designer caused delays in the case of concurrent delays.

- e. Request for extension of time shall be made in writing to the designer, copies to the owner and SCO, within twenty (20) days following cause of delay. In case of continuing cause for delay, the Contractor shall notify the Designer to the designer, copies to the owner and SCO, of the delay within 20 days of the beginning of the delay and only one claim is necessary.
- f. The contractor shall notify his surety in writing of extension of time granted.
- g. No claim for time extension shall be allowed on account of failure of the designer to furnish drawings or instructions until twenty (20) days after demand for such drawings and/or instructions. See Article 5c. Demand must be in written form clearly stating the potential for delay unless the drawings or instructions are provided. Any delay granted will begin after the twenty (20) day demand period is concluded.

ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY

- a. The owner may desire to occupy or utilize all or a portion of the project prior to the completion of the project.
- b. Should the owner request a utilization of a building or portion thereof, the designer shall perform a designer final inspection of area after being notified by the contractor that the area is ready for such. After the contractor has completed designer final inspection punch list and the designer has verified, then the designer shall schedule a beneficial occupancy inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office. If beneficial occupancy is granted by the State Construction Office, in such areas the following will be established:
 - 1. The beginning of guarantees and warranties period for the equipment necessary to support. in the area.
 - 2. The owner assumes all responsibilities for utility costs for entire building.
 - 2. Contractor will obtain consent of surety.
 - 3. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.
- c. The owner shall have the right to exclude the contractor from any part of the project which the designer has so certified to be substantially complete, but the owner will allow the contractor reasonable access to complete or correct work to bring it into compliance with the contract.
- d. Occupancy by the owner under this article will in no way relieve the contractor from his contractual requirement to complete the project within the specified time. The contractor will not be relieved of liquidated damages because of beneficial occupancy. The designer may prorate liquidated damages based on the percentage of project occupied.

ARTICLE 25 - FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT

- a. Upon notification from the contractor(s) that the project is complete and ready for inspection, the designer shall make a Designer final inspection to verify that the project is complete and ready for SCO final inspection. Prior to SCO final inspection, the contractor(s) shall complete all items requiring corrective measures noted at the Designer

final inspection. The designer shall schedule a SCO final inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office.

- b. At the SCO final inspection, the designer and his consultants shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the contract documents. At the conclusion of the SCO final inspection, the designer and State Construction Office representative shall make one of the following determinations:
 - 1. That the project is completed and accepted.
 - 2. That the project will be accepted subject to the correction of the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of SCO final inspection or the owner may invoke Article 28, Owner's Right to Do Work.
 - 4. That the project is not complete and another date for a SCO final inspection will be established.
- c. Within fourteen (14) days of final acceptance per Paragraph b1 or within fourteen (14) days after completion of punch list per Paragraph b2 above, the designer shall certify the work and issue applicable certificate(s) of compliance.
- d. Any discrepancies listed or discovered after the date of SCO final inspection and acceptance under Paragraphs b1 or b2 above shall be handled in accordance with Article 42, Guarantee.
- f. The final acceptance date will establish the following:
 - 1. The beginning of guarantees and warranties period.
 - 2. The date on which the contractor's insurance coverage for public liability, property damage and builder's risk may be terminated.
 - 3. That no liquidated damages (if applicable) shall be assessed after this date.
 - 4. The termination date of utility cost to the contractor.
- g. **Prior to issuance of final acceptance date, the contractor shall have his authorized representatives visit the project and give full instructions to the designated personnel regarding operating, maintenance, care, and adjustment of allequipment and special construction elements. In addition, the contractor shall provide to the owner a complete instructional video (media format acceptable to the owner) on the operation, maintenance, care and adjustment of all equipment and special construction elements.**

ARTICLE 26 - CORRECTION OF WORK BEFORE FINAL PAYMENT

- a. Any work, materials, fabricated items or other parts of the work which have been condemned or declared not in accordance with the contract by the designer shall be promptly removed from the work site by the contractor, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the owner. Work or property of other contractors or the owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the contractor whose work is faulty.

- b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the designer, and shall make satisfactory progress, as determined by the designer, until completed.
- c. Should the contractor fail to proceed with the required corrections, then the owner may complete the work in accordance with the provisions of Article 28.

ARTICLE 27 - CORRECTION OF WORK AFTER FINAL PAYMENT

See Article 35, Performance Bond and Payment Bond, and Article 42, Guarantee. Neither the final certificate, final payment, occupancy of the premises by the owner, nor any provision of the contract, nor any other act or instrument of the owner, nor the designer, shall relieve the contractor from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. Contractor shall correct or make good any defects due thereto and repair any damage resulting there from, which may appear during the guarantee period following final acceptance of the work except as stated otherwise under Article 42, Guarantee. The owner will report any defects as they may appear to the contractor and establish a time limit for completion of corrections by the contractor. The owner will be the judge as to the responsibility for correction of defects.

ARTICLE 28 - OWNER'S RIGHT TO DO WORK

If, during the progress of the work or during the period of guarantee, the contractor fails to prosecute the work properly or to perform any provision of the contract, the owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the contractor from the designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the contractor, such action and cost of same having been first approved by the designer. Should the cost of such action of the owner exceed the amount due or to become due the contractor, then the contractor or his surety, or both, shall be liable for and shall pay to the owner the amount of said excess.

ARTICLE 29 - ANNULMENT OF CONTRACT

If the contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time above specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work, or shall perform the work unsuitably or shall discontinue the prosecution of the work, or if the contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the owner may give notice in writing, sent by certified mail, return receipt requested, to the contractor and his surety of such delay, neglect or default, specifying the same, and if the contractor within a period of seven (7) days after such notice shall not proceed in accordance therewith, then the owner shall, declare this contract in default, and, thereupon, the surety shall promptly take over the work and complete the performance of this contract in the manner and within the time frame specified. In the event the surety shall fail to take over the work to be done under this contract within seven (7) days after being so notified and notify the owner in writing, sent by certified mail, return receipt requested, that he is taking the same over and stating that he will diligently pursue and complete the same, the owner shall have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of said contractor, to appropriate or use any or all contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said contract according to the terms and provisions thereof

or use such other methods as in his opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the owner, together with the costs of completing the work under contract, shall be deducted from any monies due or which may become due said contractor and surety. In case the expense so incurred by the owner shall be less than the sum which would have been payable under the contract, if it had been completed by said contractor, then the said contractor and surety shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the contract, then the contractor and the surety shall be liable and shall pay to the owner the amount of said excess.

ARTICLE 30 - CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT

- a. Should the work be stopped by order of a court having jurisdiction, or by order of any other public authority for a period of three months, due to cause beyond the fault or control of the contractor, or if the owner should fail or refuse to make payment on account of a certificate issued by the designer within forty-five (45) days after receipt of same, then the contractor, after fifteen (15) days' written notice sent by certified mail, return receipt requested, to the owner and the designer, may suspend operations on the work or terminate the contract.
- b. The owner shall be liable to the contractor for the cost of all materials delivered and work performed on this contract plus 10 percent overhead and profit and shall make such payment. The designer shall be the judge as to the correctness of such payment.

ARTICLE 31 - REQUEST FOR PAYMENT

- a. Not later than the fifth day of the month, the contractor shall submit to the designer a request for payment for work done during the previous month. The request shall be in the form agreed upon between the contractor and the designer, but shall show substantially the value of work done and materials delivered to the site during the period since the last payment, and shall sum up the financial status of the contract with the following information:
 - 1. Total of contract including change orders.
 - 2. Value of work completed to date.
 - 3. Less five percent (5%) retainage, provided however, that after fifty percent (50%) of the contractor's work has been satisfactorily completed on schedule, with approval of the owner and the State Construction Office and written consent of the surety, further requirements for retainage will be waived only so long as work continues to be completed satisfactorily and on schedule.
 - 4. Less previous payments.
 - 5. Current amount due.
- b. The contractor, upon request of the designer, shall substantiate the request with invoices of vouchers or payrolls or other evidence.
- c. Prior to submitting the first request, the contractor shall prepare for the designer a schedule showing a breakdown of the contract price into values of the various parts of the work, so arranged as to facilitate payments to subcontractors in accordance with Article 17, Contractor and Subcontractor Relationships. The contractor(s) shall list the

value of each subcontractor and supplier, identifying each minority business subcontractor and supplier as listed in Affidavit C, if applicable.

- d. When payment is made on account of stored materials and equipment, such materials must be stored on the owner's property, and the requests for payments shall be accompanied by invoices or bills of sale or other evidence to establish the owner's title to such materials and equipment. Such payments will be made only for materials that have been customized or fabricated specifically for this project. Raw materials or commodity products including but not limited to piping, conduit, CMU, metal studs and gypsum board may not be submitted. Responsibility for such stored materials and equipment shall remain with the contractor regardless of ownership title. Such stored materials and equipment shall not be removed from the owner's property. Should the space for storage on-site be limited, the contractor, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the contractor desire to include any such materials or equipment in his application for payment, they must be stored in the name of the owner in an independent, licensed, bonded warehouse approved by the designer, owner and the State Construction Office and located as close to the site as possible. The warehouse selected must be approved by the contractor's bonding and insurance companies; the material to be paid for shall be assigned to the owner and shall be inspected by the designer. Upon approval by the designer, owner and SCO of the storage facilities and materials and equipment, payment therefore will be certified. Responsibility for such stored materials and equipment shall remain with the contractor. Such stored materials and equipment shall not be moved except for transportation to the project site. Under certain conditions, the designer may approve storage of materials at the point of manufacture, which conditions shall be approved by the designer, the owner and the State Construction Office prior to approval for the storage and shall include an agreement by the storing party which unconditionally gives the State absolute right to possession of the materials at anytime. Bond, security and insurance protection shall continue to be the responsibility of the contractor(s).
- e. In the event of beneficial occupancy, retainage of funds due the contractor(s) may be reduced with the approval of the State Construction Office to an equitable amount to cover the list of items to be completed or corrected. Retainage may not be reduced to less than two and one-half (2 1/2) times the estimated value of the work to be completed or corrected. Reduction of retainage must be with the consent and approval of the contractor's bonding company.

ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT

- a. Within five (5) days from receipt of request for payment from the contractor, the designer shall issue and forward to the owner a certificate for payment. This certificate shall indicate the amount requested or as approved by the designer. If the certificate is not approved by the designer, he shall state in writing to the contractor and the owner his reasons for withholding payment.
- b. No certificate issued or payment made shall constitute an acceptance of the work or any part thereof. The making and acceptance of final payment shall constitute a waiver of all claims by the owner except:
 - 1. Claims arising from unsettled liens or claims against the contractor.
 - 2. Faulty work or materials appearing after final payment.
 - 3. Failure of the contractor to perform the work in accordance with drawings and specifications, such failure appearing after payment.

4. As conditioned in the performance bond and payment bond.
- c. The making and acceptance of final payment shall constitute a waiver of all claims by the contractor except those claims previously made and remaining unsettled (Article 20(c)).
- d. Prior to submitting request for final payment to the designer for approval, the contractor shall fully comply with all requirements specified in the “project closeout” section of the specifications. These requirements include but not limited to the following:
 1. Submittal of Product and Operating Manuals, Warranties and Bonds, Guarantees, Maintenance Agreements, As-Built Drawings, Certificates of Inspection or Approval from agencies having jurisdiction. (The designer must approve the Manuals prior to delivery to the owner).
 2. Transfer of Required attic stock material and all keys in an organized manner.
 3. Record of Owner’s training.
 4. Resolution of any final inspection discrepancies.
 5. Granting access to Contractor’s records, if Owner’s internal auditors have made a request for such access pursuant to Article 52.
- e. The contractor shall forward to the designer, the final application for payment along with the following documents:
 1. List of minority business subcontractors and material suppliers showing breakdown of contract amounts and total actual payments to subs and material suppliers.
 2. Affidavit of Release of Liens.
 3. Affidavit of contractors of payment to material suppliers and subcontractors. (See Article 36).
 4. Consent of Surety to Final Payment.
 5. Certificates of state agencies required by state law.
- f. The designer will not authorize final payment until the work under contract has been certified by designer, certificates of compliance issued, and the contractor has complied with the closeout requirements. The designer shall forward the contractor’s final application for payment to the owner along with respective certificate(s) of compliance required by law.

ARTICLE 33 - PAYMENTS WITHHELD

- a. The designer with the approval of the State Construction Office may withhold payment for the following reasons:
 1. Faulty work not corrected.

2. The unpaid balance on the contract is insufficient to complete the work in the judgment of the designer.
 3. To provide for sufficient contract balance to cover liquidated damages that will be assessed.
- b. The secretary of the Department of Administration may authorize the withholding of payment for the following reasons:
 1. Claims filed against the contractor or evidence that a claim will be filed.
 2. Evidence that subcontractors have not been paid.
 - c. The Owner may withhold all or a portion of Contractor's general conditions costs set forth in the approved schedule of values, if Contractor has failed to comply with: (1) a request to access its records by Owner's internal auditors pursuant to Article 52; (2) a request for a plan of action and/or recovery schedule under Article 14.j or provide The Owner; (3) a request to provide an electronic copies of Contractor's baseline schedule, updates with all logic used to create the schedules in the original format of the scheduling software; and (4) Contractor's failure to have its Superintendent on the Project full-time; (
 - d. When grounds for withholding payments have been removed, payment will be released. Delay of payment due the contractor without cause will make owner liable for payment of interest to the contractor in accordance with G.S. 143-134.1. As provided in G.S.143-134.1(e) the owner shall not be liable for interest on payments withheld by the owner for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

ARTICLE 34 - MINIMUM INSURANCE REQUIREMENTS

The work under this contract shall not commence until the contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the owner. These certificates shall document that coverages afforded under the policies will not be cancelled, reduced in amount or coverages eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the owner of such alteration or cancellation. If endorsements are needed to comply with the notification or other requirements of this article copies of the endorsements shall be submitted with the certificates.

a. Worker's Compensation and Employer's Liability

The contractor shall provide and maintain, until final acceptance, workmen's compensation insurance, as required by law, as well as employer's liability coverage with minimum limits of \$100,000.

b. Public Liability and Property Damage

The contractor shall provide and maintain, until final acceptance, comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily injury, including accidental death, as well as from claims for property damages which may arise from operations under this contract, whether such operations be by the contractor or by any subcontractor, or by

anyone directly or indirectly employed by either of them and the minimum limits of such insurance shall be as follows:

Bodily Injury:	\$500,000 per occurrence
Property Damage:	\$100,000 per occurrence / \$300,000 aggregate

In lieu of limits listed above, a \$500,000 combined single limit shall satisfy both conditions.

Such coverage for completed operations must be maintained for at least two (2) years following final acceptance of the work performed under the contract.

c. Property Insurance (Builder's Risk/Installation Floater)

The contractor shall purchase and maintain property insurance until final acceptance, upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the owner, the contractor, the subcontractors and sub-subcontractors in the work and shall insure against the perils of fire, wind, rain, flood, extended coverage, and vandalism and malicious mischief. If the owner is damaged by failure of the contractor to purchase or maintain such insurance, then the contractor shall bear all reasonable costs properly attributable thereto; the contractor shall effect and maintain similar property insurance on portions of the work stored off the site when request for payment per articles so includes such portions.

d. Deductible

Any deductible, if applicable to loss covered by insurance provided, is to be borne by the contractor.

e. Other Insurance

The contractor shall obtain such additional insurance as may be required by the owner or by the General Statutes of North Carolina including motor vehicle insurance, in amounts not less than the statutory limits.

f. Proof of Carriage

The contractor shall furnish the owner with satisfactory proof of carriage of the insurance required before written approval is granted by the owner.

ARTICLE 35 - PERFORMANCE BOND AND PAYMENT BOND

- a. Each contractor shall furnish a performance bond and payment bond executed by a surety company authorized to do business in North Carolina. The bonds shall be in the full contract amount. Bonds shall be executed in the form bound with these specifications.
- b. All bonds shall be countersigned by an authorized agent of the bonding company who is licensed to do business in North Carolina.

ARTICLE 36 - CONTRACTOR'S AFFIDAVIT

The final payment of retained amount due the contractor on account of the contract shall not become due until the contractor has furnished to the owner through the designer an affidavit signed, sworn and notarized to the effect that all payments for materials, services or subcontracted work in connection with his contract have been satisfied, and that no claims or

liens exist against the contractor in connection with this contract. In the event that the contractor cannot obtain similar affidavits from subcontractors to protect the contractor and the owner from possible liens or claims against the subcontractor, the contractor shall state in his affidavit that no claims or liens exist against any subcontractor to the best of his (the contractor's) knowledge, and if any appear afterward, the contractor shall save the owner harmless.

ARTICLE 37 - ASSIGNMENTS

The contractor shall not assign any portion of this contract nor subcontract in its entirety. Except as may be required under terms of the performance bond or payment bond, no funds or sums of money due or become due the contractor under the contract may be assigned.

ARTICLE 38 - USE OF PREMISES

- a. The contractor(s) shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the designer and owner and shall not exceed those established limits in his operations.
- b. The contractor(s) shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- c. The contractor(s) shall enforce the designer's and owner's instructions regarding signs, advertisements, fires and smoking.
- d. No firearms, any type of alcoholic beverages, or drugs (other than those prescribed by a physician) will be permitted at the job site.

ARTICLE 39 - CUTTING, PATCHING AND DIGGING

- a. The contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the drawings and specifications for the completed structure, as the designer may direct.
- b. Any cost brought about by defective or ill-timed work shall be borne by the party responsible therefor.
- c. No contractor shall endanger any work of another contractor by cutting, digging or other means. No contractor shall cut or alter the work of any other contractor without the consent of the designer and the affected contractor(s).

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

- a. The contractor shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer and other utility services which maybe necessary and required for completion of the project including all utilities required for testing, cleaning, balancing, and sterilization of designated plumbing, mechanical and electrical systems. Any permanent meters installed shall be listed in the contractor's name until work has a final acceptance. The contractor will be solely responsible for all utility costs prior to final acceptance. Contractor shall contact all affected utility companies prior to bid to determine their requirements to provide temporary and permanent service and include all costs associated with providing those services in their bid. Coordination of the work of the utility companies during construction is the sole responsibility of the contractor.

- b. Meters shall be relisted in the owner's name on the day following final acceptance of the Project Expediter's work, and the owner shall pay for services used after that date.
- c. The owner shall be reimbursed for all metered utility charges after the meter is relisted in the owner's name and prior to completion and acceptance of the work of **all** contractors. Reimbursement shall be made by the contractor whose work has not been completed and accepted. If the work of two or more contractors has not been completed and accepted, reimbursement to the owner shall be paid by the contractors involved on the basis of assessments by the designer.
- d. Prior to the operation of permanent systems, the Project Expediter will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.
- e. All contractors shall have the permanent building systems in sufficient readiness for furnishing temporary climatic control at the time a building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion of the building sufficient to allow completion of the interior finishes of the building. A building shall be considered enclosed and secured when windows, doorways (exterior, mechanical, and electrical equipment rooms), and hardware are installed; and other openings have protection which will provide reasonable climatic control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the contractor(s), the designer and owner. Use of the equipment in this manner shall be subject to the approval of the Designer and owner and shall in no way affect the warranty requirements of the contractor(s).
- f. The electrical contractor shall have the building's permanent power wiring distribution system in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.
- g. The electrical contractor shall have the building's permanent lighting system ready at the time the general contractor begins interior painting and shall provide adequate lighting in those areas where interior painting and finishing is being performed.
- h. Each prime contractor shall be responsible for his permanently fixed service facilities and systems in use during progress of the work. The following procedures shall be strictly adhered to:
 - 1. Prior to final acceptance of work by the State Construction Office, each contractor shall remove and replace any parts of the permanent building systems damaged through use during construction.
 - 2. Temporary filters as recommended by the equipment manufacturer in order to keep the equipment and ductwork clean and free of dust and debris shall be installed in each of the heating and air conditioning units and at each return grille during construction. New filters shall be installed in each unit prior to the owner's acceptance of the work.
 - 3. Extra effort shall be maintained to keep the building and the site adjacent to the building clean and under no circumstances shall air systems be operated if finishing and site work operations are creating dust in excess of what would be considered normal if the building were occupied.
 - 4. It shall be understood that any warranty on equipment presented to the owner shall extend from the day of final acceptance by the owner. The cost of warranting the

equipment during operation in the finishing stages of construction shall be borne by the contractor whose system is utilized.

5. The electrical contractor shall have all lamps in proper working condition at the time of final project acceptance.
- i. The Project Expediter shall provide, if required and where directed, a shed for toilet facilities and shall furnish and install in this shed all water closets required for a complete and adequate sanitary arrangement. These facilities will be available to other contractors on the job and shall be kept in a neat and sanitary condition at all times. Chemical toilets are acceptable.
- j. The Project Expediter shall, if required by the Supplementary General Conditions and where directed, erect a temporary field office, complete with lights, telephone, heat and air conditioning. A portion of this office shall be partitioned off, of sufficient size, for the use of a resident inspector, should the designer so direct.
- k. On multi-story construction projects, the Project Expediter shall provide temporary elevators, lifts, or other special equipment for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall be included in the Project Expediter's bid.
- l. The Project Expediter will erect one sign on the project if required. The sign shall be of sound construction, and shall be neatly lettered with black letters on white background. The sign shall bear the name of the project, and the names of prime contractors on the project, and the name of the designer and consultants. Directional signs may be erected on the owner's property subject to approval of the owner with respect to size, style and location of such directional signs. Such signs may bear the name of the contractor and a directional symbol. No other signs will be permitted except by permission of the owner.

ARTICLE 41 - CLEANING UP

- a. The contractors shall keep the building and surrounding area reasonably free from rubbish at all times, and shall remove debris from the site on a timely basis or when directed to do so by the designer or Project Expediter. The Project Expediter shall provide an on site refuse container(s) for the use of all contractors. Each contractor shall remove their rubbish and debris from the building on a daily basis. The Project Expediter shall broom clean the building as required to minimize dust and dirt accumulation.
- b. The Project Expediter shall provide and maintain suitable all-weather access to the building.
- c. Before final inspection and acceptance of the building, each contractor shall clean his portion of the work, including glass, hardware, fixtures, masonry, tile and marble (using no acid), clean and wax all floors as specified, and completely prepare the building for use by the owner, with no cleaning required by the owner.

ARTICLE 42 - GUARANTEE

- a. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the date of final acceptance of the work or beneficial occupancy and shall replace such defective materials or workmanship without cost to the owner.

- b. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.
- c. Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.
- d. Guarantees for roof, equipment, materials, and supplies shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

ARTICLE 43 - CODES AND STANDARDS

Wherever reference is given to codes, standard specifications or other data published by regulating agencies including, but not limited to, national electrical codes, North Carolina state building codes, federal specifications, ASTM specifications, various institute specifications, etc., it shall be understood that such reference is to the latest edition including addenda published prior to the date of the contract documents.

ARTICLE 44 - INDEMNIFICATION

To the fullest extent permitted by law, the contractor shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance or failure of performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the contractor, the contractor's subcontractor, or the agents of either the contractor or the contractor's subcontractor. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this article.

ARTICLE 45 - TAXES

- a. Federal excise taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3442(3)).
- b. Federal transportation taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3475(b) as amended).
- c. North Carolina sales tax and use tax, as required by law, do apply to materials entering into state work and such costs shall be included in the bid proposal and contract sum.
- d. Local option sales and use taxes, as required by law, do apply to materials entering into state work as applicable and such costs shall be included in the bid proposal and contract sum.
- e. **Accounting Procedures for Refund of County Sales & Use Tax**

Amount of county sales and use tax paid per contractor's statements:

Contractors performing contracts for state agencies shall give the state agency for whose project the property was purchased a signed statement containing the information listed in G.S. 105-164.14(e).

The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement as of April 1, 1991 from the contractor setting forth the date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered should be listed. The contractor should also be notified that the certified statement may be subject to audit.

In the event the contractors make several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, the counties, and the county sales and use taxes paid thereon.

Name of taxing county: The position of a sale is the retailer's place of business located within a taxing county where the vendor becomes contractually obligated to make the sale. Therefore, it is important that the county tax be reported for the county of sale rather than the county of use.

When property is purchased from out-of-state vendors and the county tax is charged, the county should be identified where delivery is made when reporting the county tax.

Such statement must also include the cost of any tangible personal property withdrawn from the contractor's warehouse stock and the amount of county sales or use tax paid thereon by the contractor.

Similar certified statements by his subcontractors must be obtained by the general contractor and furnished to the claimant.

Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the building or structure.

ARTICLE 46 - EQUAL OPPORTUNITY CLAUSE

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the secretary of Labor, are incorporated herein.

ARTICLE 47 - EMPLOYMENT OF INDIVIDUALS WITH DISABILITIES

The contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental disabilities in regard to any position for which the employee or applicant is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with such disabilities without discrimination based upon their physical or mental disability in all employment practices.

ARTICLE 48 - ASBESTOS-CONTAINING MATERIALS (ACM)

The State of North Carolina has attempted to address all asbestos-containing materials that are to be disturbed in the project. However, there may be other asbestos-containing materials in the work areas that are not to be disturbed and do not create an exposure hazard.

Contractors are reminded of the requirements of instructions under Instructions to Bidders and General Conditions of the Contract, titled Examination of Conditions. Statute 130A, Article 19, amended August 3, 1989, established the Asbestos Hazard Management Program that controls asbestos abatement in North Carolina. The latest edition of *Guideline Criteria for Asbestos Abatement* from the State Construction Office is to be incorporated in all asbestos abatement projects for the Capital Improvement Program.

ARTICLE 49 - MINORITY BUSINESS PARTICIPATION

GS 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix E are hereby incorporated into and made a part of this contract.

ARTICLE 50 – CONTRACTOR EVALUATION

The contractor's overall work performance on the project shall be fairly evaluated in accordance with the State Building Commission policy and procedures, for determining qualifications to bid on future State capital improvement projects. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, Contractor Evaluation Procedures, is hereby incorporated and made a part of this contract. The owner may request the contractor's comments to evaluate the designer.

ARTICLE 51 – GIFTS

Pursuant to N.C. Gen. Stat. § 133-32, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, subcontractor, supplier, vendor, etc.), to make gifts or to give favors to any State employee. This prohibition covers those vendors and contractors who: (1) have a contract with a governmental agency; or (2) have performed under such a contract within the past year; or (3) anticipate bidding on such a contract in the future. For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review G.S. Sec. 133-32.

During the construction of the Project, the Contractor is prohibited from making gifts to any of the Owner's employees, Owner's project representatives (architect, engineers, construction manager and their employees), employees of the State Construction Office and/or any other State employee that may have any involvement, influence, responsibilities, oversight, management and/or duties that pertain to and/or relate to the contract administration, financial administration and/or disposition of claims arising from and/or relating to the Contract and/or Project.

ARTICLE 52 – AUDITING-ACCESS TO PERSONS AND RECORDS

In accordance with N.C. General Statute 147-64.7, the State Auditor shall have access to Contractor's officers, employees, agents and/or other persons in control of and/or responsible for the Contractor's records that relate to this Contracts for purposes of conducting audits under the referenced statute. The Owner's internal auditors shall also have the right to access and copy the Contractor's records relating to the Contract and Project during the term of the Contract and within two years following the completion of the Project/close-out of the Contract to verify accounts, accuracy, information, calculations and/or data affecting and/or

relating to Contractor's requests for payment, requests for change orders, change orders, claims for extra work, requests for time extensions and related claims for delay/extended general conditions costs, claims for lost productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, and/or any other type of claim for payment or damages from Owner and/or its project representatives.

ARTICLE 53 – NORTH CAROLINA FALSE CLAIMS ACT

The North Carolina False Claims Act ("NCFCA"), N.C. Gen. Stat. § 1-605 through 1-618, applies to this Contract. The Contractor should familiarize itself with the entire NCFCA and should seek the assistance of an attorney if it has any questions regarding the NCFCA and its applicability to any requests, demands and/or claims for payment it submits to the State through the contracting state agency, institution, university or community college.

The purpose of the NCFCA "is to deter persons from knowingly causing or assisting in causing the State to pay claims that are false or fraudulent and to provide remedies in the form of treble damages and civil penalties when money is obtained from the State by reason of a false or fraudulent claim." (Section 1-605(b).) A contractor's liability under the NCFCA may arise from, but is not limited to: requests for payment, invoices, billing, claims for extra work, requests for change orders, requests for time extensions, claims for delay damages/extended general conditions costs, claims for lost productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, documentation used to support any of the foregoing requests or claims, and/or any other request for payment from the State through the contracting state agency, institution, university or community college. The parts of the NCFCA that are most likely to be enforced with respect to this type of contract are as follows:

- A "claim" is "[a]ny request or demand, whether under a contract or otherwise, for money or property and whether or not the State has title to the money or property that (i) is presented to an officer, employee, or agent of the State or (ii) is made to a contractor ... if the money or property is to be spent or used on the State's behalf or to advance a State program or interest and if the State government: (a) provides or has provided any portion of the money or property that is requested or demanded; or (b) will reimburse such contractor ... for any portion of the money or property which is requested or demanded." (Section 1-606(2).)
- "Knowing" and "knowingly." – Whenever a person, with respect to information, does any of the following: (a) Has actual knowledge of the information; (b) Acts in deliberate ignorance of the truth or falsity of the information; and/or (c) Acts in reckless disregard of the truth or falsity of the information. (Section 1-606(4).) Proof of specific intent to defraud is not required. (Section 1-606(4).)
- "Material" means having a natural tendency to influence, or be capable of influencing, the payment or receipt of money or property. (Section 1-606(4).)
- Liability. – "Any person who commits any of the following acts shall be liable to the State for three times the amount of damages that the State sustains because of the act of that person[:] ... (1) Knowingly presents or causes to be presented a false or fraudulent claim for payment or approval. (2) Knowingly makes, uses, or causes to be made or used, a false record or statement material to a false or fraudulent claim. (3) Conspires to commit a violation of subdivision (1), (2) ..." (Section 1-607(a)(1), (2).)

- The NCFCA shall be interpreted and construed so as to be consistent with the federal False Claims Act, 31 U.S.C. § 3729, et seq., and any subsequent amendments to that act. (Section 1-616(c).)

Finally, the contracting state agency, institution, university or community college may refer any suspected violation of the NCFCA by the Contractor to the Attorney General's Office for investigation. Under Section 1-608(a), the Attorney General is responsible for investigating any violation of NCFCA, and may bring a civil action against the Contractor under the NCFCA. The Attorney General's investigation and any civil action relating thereto are independent and not subject to any dispute resolution provision set forth in this Contract. (See Section 1-608(a).)

ARTICLE 54 – TERMINATION FOR CONVENIENCE

Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.

SUPPLEMENTARY GENERAL CONDITIONS

The following supplements modify the "Instructions to Bidders and General Conditions of the Contract" prepared by the State Construction Office – North Carolina Department of Administration (OC-15, 24th Edition-January 2013, Revision 1-May 2025: Article 23.b).

Where a portion of the General Conditions is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of the General Conditions shall remain in effect.

INSTRUCTIONS TO BIDDERS ARTICLE 2 – EXAMINATION OF CONDITIONS

Add the following paragraph:

"A **MANDATORY Pre-Bid Meeting** for Interested General Contractors will be held in the conference room of the Aviation East North Carolina Forest Service Duplin Hanger (212 Airport Road, Kenansville, North Carolina, 28349) at **2:00 PM on Tuesday, July 15, 2025**. The meeting will address project specific questions, issues, bidding procedures, and bid forms. The purpose of conference is for prospective Bidders to familiarize themselves with the site and to ask questions pertaining to the Contract Documents. Bidders are reminded that no oral interpretations of meaning of Drawings and Specifications can be made. Conflicts in documents, if any, will be resolved by written addendum."

INSTRUCTIONS TO BIDDERS ARTICLE 4 – BID SECURITY

Add the following paragraph:

"Surety Companies must be listed on the U.S. Department of Treasury's Listing of Approved Sureties (Department Circular 570; 2015 Revision – Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies)."

GENERAL CONDITIONS ARTICLE 1 – DEFINITIONS

Revise Article 1b. to read as follows:

"The **Owner** is North Carolina Department of Agriculture & Consumer Services."

Add the following to paragraph (i.):

"The Project Expediter shall be the General Contractor. "

GENERAL CONDITIONS ARTICLE 2 – INTENT AND EXECUTION OF THE DOCUMENTS

Add subparagraph (11.) to paragraph C. as follows:

11. The Contractor shall execute and deliver the Contract to the Owner in accordance with the NC General Statutes, within 10 days of award. The date of commencement of work shall be, unless otherwise stated in the Notice to Proceed, deemed as ten (10) days after mailing of the written notice of award of contract to the Contractor.

GENERAL CONDITIONS ARTICLE 18 – DESIGNER'S STATUS

Add the following to Article 18a:

1. The Architect is: **Williard Stewart Architects, PA**
122 Cox Avenue
Raleigh, North Carolina 27605

2. The Architect's Consulting Engineers:
 - a. Plumbing, Mechanical, Electrical, & Fire Protection Engineer:
Atlantec Engineers, PA | IMEG Consultants Corporation
3221 Blue Ridge Road, Suite 113
Raleigh, North Carolina 27612
 - b. Structural Engineer:
Ross Linden Engineers PC
709 West Jones Street
Raleigh, North Carolina 27603
 - c. Civil Engineer:
Timmons Group
5410 Trinity Road, Suite 102
Raleigh, North Carolina 27607
3. The Architect's Facility Equipment Consultant:
HDR
11700 Katy Freeway, Suite 250, Energy Tower 1
Houston, Texas 77079

GENERAL CONDITIONS ARTICLE 23 – TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

Add subparagraph 1. to paragraph a. as follows:

1. The Contract Time shall be **five hundred (500)** consecutive calendar days, beginning on the Date of Commencement as specified in the written Notice-to-Proceed.

Add subparagraph 1. to paragraph b. as follows:

1. For each day in excess of the above number of days specified in Article 23, paragraph a. of the General Conditions, the Contractor(s) shall pay the Owner **\$500.00** (five hundred dollars) as liquidated damages by reason of failure of the Contractor(s) to complete the work within the time specified, such time being of the essence of this contract and material consideration thereof.

GENERAL CONDITIONS ARTICLE 25 – FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT

Add paragraph H. as follows:

- H. In addition to the General Contractor providing one (1) complete set of all as-built drawings on paper and one (1) complete set of all approved submittals and product data on paper, the General Contractor shall provide the Architect with one (1) PDF set of the contractor as-built drawings as PDF electronic scans and one (1) completed PDF set of all approved submittals and product data on a USB flash drive.

GENERAL CONDITIONS ARTICLE 34 – MINIMUM INSURANCE REQUIREMENTS

Revise paragraph a. as follows:

Limit of Workers Compensation Minimum: \$1,000,000.00.

Revise paragraph a. as follows:

Employer's Liability Coverage shall be provided as follows: \$1,000,000.00.

Add subparagraph 1. to paragraph b. as follows:

1. General Liability Insurance shall be provided as follows: \$1,000,000.00.

Revise paragraph c. as follows:

"The Contractor shall purchase and maintain property insurance during the life of this contract, upon the entire work at the site to the full insurable value thereof. The insurance shall include the interest of the Owner, the Contractor, the subcontractors and the subcontractors in the work and shall insure against risk of direct physical loss – (all perils). If the Owner is damaged by failure of the Contractor to purchase or maintain such insurance, then the Contractor shall bear all reasonable costs properly attributed thereto; the Contractor shall effect and maintain similar property insurance on portions of the work stored off the site when request for payment per articles so include such portions."

GENERAL CONDITIONS ARTICLE 35 – PERFORMANCE AND PAYMENT BOND

Add the following paragraph:

- c. Surety Companies must be listed on the U.S. Department of Treasury's Listing of Approved Sureties (Department Circular 570; 2015 Revision – Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies).

GENERAL CONDITIONS ARTICLE 40 – UTILITIES, STRUCTURES, SIGNS

Revise paragraph a. as follows:

- a. The Project Expediter shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer, and other utility services, which may be necessary and required for completion of the project. Any permanent meters installed shall be listed in the Project Expediter's name until his work is fully accepted by the owner. The Project Expediter shall pay all utilities costs. The Project Expediter, as applicable, may recover actual costs of metered utilities from the responsible party should delays occur in project completion.

GENERAL CONDITIONS ARTICLE 42 – GUARANTEE

Add the following paragraph:

- e. All warranties will commence upon Final Acceptance by the Owner, in writing, of the project for its intended use. Any item not completed upon Final Acceptance will be warranted for the period after which it is finally, and completely, accepted by the Owner in writing.

END OF SUPPLEMENTARY GENERAL CONDITIONS

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of \$300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
 - a. Black, that is, a person having origins in any of the black racial groups in Africa;
 - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
 - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
 - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
 - e. Female
2. Minority Business - means a business:
 - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
 - b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.
3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".
4. Public Entity - means State and all public subdivisions and local governmental units.
5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.
6. Designer - Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.
7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.
10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

- a. Identify those areas of work for which there are minority businesses, as requested.
- b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
- c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

- (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
- (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
- (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
- (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
- (5) The HUB Office also oversees the minority business program by:
 - a. Monitoring compliance with the program requirements.
 - b. Assisting in the implementation of training and technical assistance programs.
 - c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
 - d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office

The State Construction Office will be responsible for the following:

- a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
 - (1) Project description and location;
 - (2) Locations where bidding documents may be reviewed;
 - (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
 - (4) Date, time and location of the bid opening.
 - (5) Date, time and location of prebid conference, if scheduled.
- b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

- c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
- d. Reviewing of minority business requirements at Preconstruction conference.
- e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
- f. Provide statistical data and required reports to the HUB Office.
- g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner

Before awarding a contract, owner shall do the following:

- a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
- b. Attend the scheduled prebid conference.
- c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
 - 1. A description of the work for which the bid is being solicited.
 - 2. The date, time, and location where bids are to be submitted.
 - 3. The name of the individual within the owner's organization who will be available to answer questions about the project.
 - 4. Where bid documents may be reviewed.
 - 5. Any special requirements that may exist.
- d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
- e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
- g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
- h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
- i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer

Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

- a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
- b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
- c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

- e. During construction phase of the project, review “MBE Documentation for Contract Payment” – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime bidding, construction manager at risk and alternative contracting methods, contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
 - (1) A description of the work for which the subbid is being solicited.
 - (2) The date, time and location where subbids are to be submitted.
 - (3) The name of the individual within the company who will be available to answer questions about the project.
 - (4) Where bid documents may be reviewed.
 - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
- e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
- f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
- g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
- h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

- k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
- l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities

While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES

It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: www.nc-sco.com

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: <http://www.nc-sco.com>

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts or affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

- (1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.
- (2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.
- (3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
- (4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- (5) Attending any prebid meetings scheduled by the public owner.
- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
- (7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- (8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- (9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- (10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* INDICATE TYPE OF MBE	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A), American Indian (I), Female (F), Social and Economically Disadvantage (D)

Date: _____ Approved/Certified By: _____

Name

Title

Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

FORM OF PROPOSAL

Project: North Carolina Forest Service
Region 1 Headquarters

Contract: _____

Bidder: _____

SCO-ID#: 19-20001-02A

Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder proposes and agrees if this proposal is accepted to contract with the

State of North Carolina through the Department of Agriculture and Consumer Services

in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of the

North Carolina Forest Service Region 1 Headquarters

in full in complete accordance with the plans, specifications, and contract documents, to the full and entire satisfaction of the

State of North Carolina, and the North Carolina Dept of Agriculture & Consumer Services and Williard Stewart Architects, PA with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT

Base Bid:

Dollars (\$) _____

General Subcontractor:

Plumbing Subcontractor:

Lic _____

Lic _____

Mechanical Subcontractor:

Electrical Subcontractor:

Lic _____

Lic _____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

ALTERNATES

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be "added to" or "deducted from" the base bid. (Strike out "Add" or "Deduct" as appropriate.)

GENERAL CONTRACT:

Alternate No. G-1: Provide Building 02-Maintenance Building Covered Storage Extension, including all associated equipment, architectural, structural, plumbing, mechanical, electrical, and fire protection systems.

[Deduct] ☐

[Add] ☐ _____ Dollars (\$) _____

Alternate No. G-2: Provide Owner Preferred Alternate for Door Hardware in Both Buildings.

[Deduct] ☐

[Add] ☐ _____ Dollars (\$) _____

Alternate No. C-1: Extend Sitework, including grading, clearing, gravel, perimeter fencing, and site lighting. Add mow strip under all perimeter fencing.

[Deduct] ☐

[Add] ☐ _____ Dollars (\$) _____

Alternate No. E-1: Alternate to provide shop drawings, installation, testing, and Owner training of a Bi-Directional Antenna System (BDA) in Building 01-Administration Building.

[Deduct] ☐

[Add] ☐ _____ Dollars (\$) _____

Alternate No. E-2: Alternate to provide shop drawings, installation, testing, and Owner training of a Bi-Directional Antenna System (BDA) in Building 02-Maintenance Building.

[Deduct] ☐

[Add] ☐ _____ Dollars (\$) _____

UNIT PRICES

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

No. 1: Unsuitable Soils Removal in Open Areas, Off-Site Disposal, and Replacement with Off-Site Suitable Fill Soil in Open Areas. (Cu. Yd.) Unit Price (\$) _____

No. 2: Unsuitable Soils Removal in Trenches and/or Pits, Disposal Off-Site, and Replacement with Off-Site Suitable Fill Soil in Trenches and/or Pits. (Cu. Yd.) Unit Price (\$) _____

No. 3: Unsuitable Soil Removal in Open Areas, Off-Site Disposal, and Replacement with Off-Site Aggregate Base Course (ABC) Stone in Open Areas. (Cu. Yd.) Unit Price (\$) _____

No. 4: Unsuitable Soils Removal in Trenches and Pits, Disposal Off-Site, and Replacement with Off-Site Aggregate Base Course (ABC) Stone. (Cu. Yd.) Unit Price (\$) _____

No. 5: Biaxial Geo-Grid in Place. (Cu. Yd.) Unit Price (\$) _____

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the Supplementary General Conditions Article 23. Applicable liquidated damages amount is also stated in the Supplementary General Conditions Article 23.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B**) to that effect in lieu of Affidavit (**A**) required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

PROPOSAL SIGNATURE PAGE

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

(Name of firm or corporation making bid)

WITNESS:

(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or Type

Title: _____
(Owner / Partner / Pres. / V. Pres)

Address: _____

ATTEST:

By: _____ License No: _____

Title: _____ Federal I.D. No: _____
(Corp. Sec. or Asst. Sec. only)

Email Address: _____

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 7 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 8 _____

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of _____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ☐ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ☐ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ☐ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ☐ **5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- ☐ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ☐ **8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ☐ **9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ☐ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

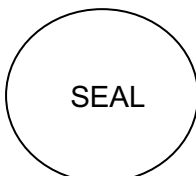
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

**State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract
with Own Workforce.**

County of _____

Affidavit of _____

(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.

(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

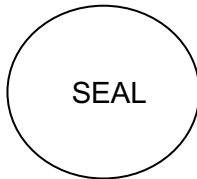
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.

This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the _____
(Name of Bidder)

Project ID# _____ (Project Name) Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

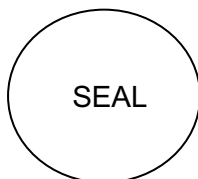
*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____



Signature: _____

Title: _____

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the _____
(Name of Bidder)

Project ID# _____ (Project Name) Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

- Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- Copies of quotes or responses received from each firm responding to the solicitation.
- A telephone log of follow-up calls to each firm sent a solicitation.
- For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- Copy of pre-bid roster
- Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- Letter detailing reasons for rejection of minority business due to lack of qualification.
- Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

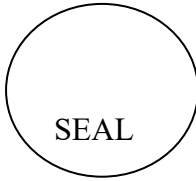
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS THAT

_____ as principal,
and, _____ as surety,
who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the State of North Carolina* through
_____ as obligee,
in the penal sum of _____ DOLLARS, lawful money of
the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors,
administrators, successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this _____ day of _____ 20_____

WHEREAS, the said principal is herewith submitting proposal for
and the principal desires to file this bid bond in lieu of making the cash
deposit as required by G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the principal shall be awarded the
contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof
within ten days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails
to so execute such contract and give performance bond as required by G.S. 143-129, the surety shall, upon demand, forth-
with pay to the obligee the amount set forth in the first paragraph hereof. Provided further, that the bid may be withdrawn
as provided by G.S. 143-129.1.

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

FORM OF CONSTRUCTION CONTRACT

THIS AGREEMENT, made the _____ day of _____ in the year of _____ by and between _____ hereinafter called the Party of the First Part and the **State of North Carolina**, through the _____ hereinafter called the Party of the Second Part.

WITNESSETH:

That the Party of the First Part and the Party of the Second Part for the consideration herein named agree as follows:

1. Scope of Work: The Party of the First Part shall furnish and deliver all of the materials, and perform all of the work in the manner and form as provided by the following enumerated plans, specifications and documents, which are attached hereto and made a part thereof as if fully contained herein: advertisement; Instructions to Bidders; General Conditions; Supplementary General Conditions; specifications; accepted proposal; contract; performance bond; payment bond; power of attorney; workmen's compensation; public liability; property damage and builder's risk insurance certificates; approval of attorney general; certificate by the Office of State Budget and Management, and drawings, titled:

North Carolina Forest Service Region 1 Headquarters

[SCO ID#: 19-20001-2A]

Consisting of the following sheets:

Name	Name
G0-001 Cover Sheet	C500A Erosion & Sediment Control Plan Phase I – Alternates
G0-101 Architectural Site Plan and General Notes	C501 Erosion & Sediment Control Plan Phase II
G0-102 Code Plans & Calculations	C501A Erosion & Sediment Control Plan Phase II – Alternates
G1-101 Administration Code Summary	C600 Site Details
G2-101 Maintenance Code Summary	C601 Site Details
C000 Civil Cover Sheet	C602 Site Details
C001 Overall Site Plan	C603 Site Details
C002 Boundary Survey Plat	C604 Site Details
C003 Topo Survey Exhibit	C605 Site Details
C100 Existing Conditions & Demolition Plan	C606 Site Details
C100A Existing Conditions & Demolition Plan-Alternates	C607 Site Details
C200 Site Plan	C608 Site Details
C200A Site Plan-Alternates	C609 Site Details
C300 Grading & Drainage Plan	C610 Site Details
C300A Grading & Drainage Plan-Alternates	C700 Landscape Plan
C301 Base Bid Storm Sewer Profiles	C700A Landscape Plan – Alternates
C301A Storm Sewer Profiles-Alternates	C701 Landscape Details
C400 Utility Plan	A1-101 Administration Floor Plan
C401 Sanitary Sewer Profiles	A1-111 Administration Reflected Ceiling Plan
C402 Fire Apparatus Access Plan	A1-121 Administration Roof Plan
C500 Erosion & Sediment Control Plan Phase I	A1-201 Administration Building Elevations

Name

A1-211 Administration | Building Sections
A1-301 Administration | Wall Sections
A1-401 Administration | Plan Details
A1-402 Administration | Plan Details
A1-403 Administration | Plan and Additional Details
A1-501 Administration | Toilet Plans and Elevations
A1-601 Administration | Millwork Plans and Details
A1-602 Administration | Millwork Plans and Details
A1-603 Administration | Millwork Plans and Details
A1-701 Administration | Doors, Windows, and Signage
A1-702 Administration | Window and Door Details
A1-801 Administration | Finishes
A2-101 Maintenance | Floor Plan
A2-102 Maintenance | Mezzanine Plan & Low RCP
A2-111 Maintenance | Reflected Ceiling Plan
A2-121 Maintenance | Roof Plan
A2-201 Maintenance | Building Elevations
A2-211 Maintenance | Building Sections
A2-301 Maintenance | Wall Sections
A2-401 Maintenance | Plan Details
A2-402 Maintenance | Details
A2-501 Maintenance | Enlarged Toilet Plans and Elevations
A2-502 Maintenance | Enlarged Stair Plans and Sections
A2-601 Maintenance | Millwork Plans and Details
A2-701 Maintenance | Doors, Windows, and Signage
A2-702 Maintenance | Door Louver and Window Details
A2-801 Maintenance | Finishes
S0-101 Structural Notes
S1-101 Admin Slab and Foundation Plan
S1-201 Admin Sections and Details
S2-101 Maintenance Slab and Foundation Plan
S2-102 Maintenance Mezzanine Plan
S2-201 Maintenance Sections and Details
S2-202 Maintenance Sections and Details
M0-001 Mechanical Notes, Legend, & Details
M0-002 Mechanical Schedules
M0-003 Mechanical Details
M0-004 Mechanical Details
M1-101 Mechanical Plan-Administration
M2-101 Mechanical Plan-Maintenance
M2-102 Mechanical Plan-Mezzanine
E0-001 Electrical Legend Notes
E0-002 Power Riser Diagram Electrical Site Plan
E0-003 Fixture Schedule
E0-004 Details

Name

E1-101 Administration Building-Lighting Plan
E1-102 Administration Building-Power Plan
E1-201 Administration Building-Panel Schedules Details
E2-101 Maintenance Building-Main Floor Lighting Plan
E2-102 Maintenance Building-Mezzanine Floor Lighting Plan
E2-103 Maintenance Building-Main Floor Power Plan
E2-104 Maintenance Building-Mezzanine Floor Power Plan
E2-201 Panel Schedules Details
E3-101 Site Lighting Plan
FA0-001 Fire Alarm Legend, Details, Site Plan
FA1-101 Administration Building-Fire Alarm Plan
FA1-102 Administration Building-Fire Alarm Riser BDA System Diagram
FA2-101 Maintenance Building-Sprinkler Alarm Plan
FA2-102 Maintenance Building-Sprinkler Alarm Riser BDA System Diagram
P0-001 Plumbing Notes, Legend, & Details
P0-002 Plumbing Schedule, Details
P0-003 Plumbing Details
P1-101 Water Piping Plan-Administration
P1-102 Waste Piping Plan-Administration
P1-103 Waste Riser Plan-Administration
P2-101 Water Piping Plan-Maintenance
P2-102 Waste Piping Plan-Maintenance
P2-103 Waste Riser Plan-Maintenance
FP0-001 Fire Protection Notes Legends and Details
FP0-002 Fire Protection Site Plan
FP1-101 Fire Protection Piping Plan-Administration
FP1-102 Fire Protection Head Plan-Administration
FP2-101 Fire Protection Piping Plan-Maintenance
FP2-102 Fire Protection Head Plan-Maintenance
FP2-103 Fire Protection Head Plan-Maintenance Mezzanine
W100 Hydraulic Analysis Layout and Results
F100 Fire System Layout
F101 Fire System Pump Sections
F102 Fire System Details
F103 Fire System Details
F104 Fire System Details
Q-001 Equipment Schedule and Notes
Q-100 Equipment Layout Plan Level 1
Q-200 Equipment Layout Plan Level 2
Q-500 Equipment Details
Q-800 Signage & Striping Notes & Legend
Q-802 Overall Signage & Striping Plan
QS-001 Service Equipment Notes & Legend
QS-100 Overall Service Equipment Layout Plan
QS-500 Service Equipment Details

Dated: _____ and the following addenda:

Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____

2. That the Party of the First Part shall commence work to be performed under this agreement on a date to be specified in a written order of the Party of the Second Part and shall fully complete all work hereunder within _____ consecutive calendar days from said date. For each day in excess thereof, liquidated damages shall be as stated in Supplementary General Conditions. The Party of the First Part, as one of the considerations for the awarding of this contract, shall furnish to the Party of the Second Part a construction schedule setting forth planned progress of the project broken down by the various divisions or part of the work and by calendar days as outlined in Article 14 of the General Conditions of the Contract.

3. The Party of the Second Part hereby agrees to pay to the Party of the First Part for the faithful performance of this agreement, subject to additions and deductions as provided in the specifications or proposal, in lawful money of the United States as follows:

_____ (\$ _____).

Summary of Contract Award:

Base Bid	\$ _____
Alternate G-1	\$ _____
Alternate G-2	\$ _____
Alternate C-1	\$ _____
Alternate E-1	\$ _____
Alternate E-2	\$ _____
TOTAL:	\$ _____

4. In accordance with Article 31 and Article 32 of the General Conditions of the Contract, the Party of the Second Part shall review, and if approved, process the Party of the First Party's pay request within 30 days upon receipt from the Designer. The Party of the Second Part, after reviewing and approving said pay request, shall make payments to the Party of the First Part on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the First Party, less five percent (5%) of the amount of such estimate which is to be retained by the Second Party until all work has been performed strictly in accordance with this agreement and until such work has been accepted by the Second Party. The Second Party may elect to waive retainage requirements after 50 percent of the work has been satisfactorily completed on schedule as referred to in Article 31 of the General Conditions.

5. Upon submission by the First Party of evidence satisfactory to the Second Party that all payrolls, material bills and other costs incurred by the First Party in connection with the construction of the work have been paid in full, final payment on account of this agreement shall be made within thirty (30) days after the completion by the First Party of all work covered by this agreement and the acceptance of such work by the Second Party.

6. It is further mutually agreed between the parties hereto that if at any time after the execution of this agreement and the surety bonds hereto attached for its faithful performance, the Second Party shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds cease to be adequate to cover the performance of the work, the First Party shall, at its expense, within five (5) days after the receipt of notice from the Second Party so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Second Party. In such event no further payment to the First Party shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Second Party.

7. The Party of the First Part attest that it and all of its subcontractors have fully complied with all requirements of NCGS 64 Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the day and date first above written in _____ counterparts, each of which shall without proof or accounting for other counterparts, be deemed an original contract.

WITNESS:

(Proprietorship or Partnership)

Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

ATTEST: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(CORPORATE SEAL)

The State of North Carolina through

WITNESS:

(Proprietorship or Partnership)

(Agency, Department or Institution)

By: _____

Title: _____

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal
(Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: North Carolina Forest Service Region 1 Headquarters [SCO ID#: 19-20001-2A]

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

NORTH CAROLINA FOREST SERVICE
REGION 1 HEADQUARTERS

SCO ID: 19-20001-02A

WITNESS:

(Proprietorship or Partnership)

Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

ATTEST: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(CORPORATE SEAL)

(Surety Company)

WITNESS:

By: _____

Title: _____
(Attorney in Fact)

COUNTERSIGNED:

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C. Regional or Branch Office Address

(SURETY CORPORATE SEAL)

FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal
(Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: **North Carolina Forest Service Region 1 Headquarters** [SCO ID#: 19-20001-2A]

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

NORTH CAROLINA FOREST SERVICE
REGION 1 HEADQUARTERS

SCO ID: 19-20001-02A

WITNESS:

(Proprietorship or Partnership)

Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

ATTEST: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(CORPORATE SEAL)

(Surety Company)

WITNESS:

By: _____

Title: _____
(Attorney in Fact)

COUNTERSIGNED:

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C. Regional or Branch Office Address

(SURETY CORPORATE SEAL)

Sheet for Attaching Power of Attorney

Sheet for Attaching Insurance Certificates

Approval of the Attorney General

**CERTIFICATION BY THE OFFICE OF
STATE BUDGET AND MANAGEMENT**

Provision for the payment of money to fall due and payable by the

Under this agreement has been provided for by allocation made and is available for the purpose of carrying out this agreement.

This _____ day of _____ 20_____.

Signed _____
Budget Officer

STATE OF NORTH CAROLINA
COUNTY SALES AND USE TAX REPORT
SUMMARY TOTALS AND CERTIFICATION

CONTRACTOR: _____ Page 1 of _____

PROJECT: _____ FOR PERIOD: _____

	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL ALL COUNTIES
CONTRACTOR						
SUBCONTRACTOR(S)*						
COUNTY TOTAL						

* Attach subcontractor(s) report(s)
** Must balance with Detail Sheet(s)

I certify that the above figures do not include any tax paid on supplies, tools and equipment which were used to perform this contract and only includes those building materials, supplies, fixtures and equipment which actually became a part of or annexed to the building or structure. I certify that, to the best of my knowledge, the information provided here is true, correct, and complete.

Sworn to and subscribed before me,

This the _____ day of _____, 20____
Signed _____

Notary Public

My Commission Expires: _____
Print or Type Name of Above

Seal
NOTE:
This certified statement may be subject to audit.

Page 2 of

CONTRACTOR:

SUBCONTRACTOR

FOR PERIOD: _____

PROJECT: _____

PURCHASE DATE	VENDOR NAME	INVOICE NUMBER	TYPE OF PROPERTY	INVOICE TOTAL	COUNTY TAX PAID	COUNTY OF SALE *
				\$	\$	
				TOTAL:	\$	

* If this is an out-of-state vendor, the County of Sale should be the county to which the merchandise was shipped.

SECTION 011000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased Construction.
 - 4. Work under Owner's separate contracts.
 - 5. Owner-Furnished/Owner-Installed (OF/OI) products.
 - 6. Owner-Furnished/Contractor-Installed (OF/CI) products.
 - 7. Contractor's use of site and premises.
 - 8. Coordination with occupants.
 - 9. Work restrictions.
 - 10. Specification and Drawing conventions.
 - 11. Miscellaneous provisions.

1.3 PROJECT INFORMATION

- A. Project Identification: North Carolina Forest Service Region 1 Headquarters; NCSCO ID: 19-20001-02A.
 - 1. Project Location:
260 Airport Road
Kenansville, NC 28349.
- B. Owner: North Carolina Department of Agriculture & Consumer Services.
 - 1. Owner's Representative:
Andrew Meier
919-707-3238
andrew.meier@ncagr.gov
- C. Architect: Williard Stewart Architects, PA.
 - 1. Architect's Representative:
Paul Stewart, AIA
919-740-5521
paul@wscarchitects.com
- D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Civil Engineering: **Timmons Group.**
2. Structural Engineering: **Ross Linden Engineers PC.**
3. Plumbing, Mechanical, Electrical, Fire Protection Engineering: **Atlantec Engineers, PA. | IMEG Consulting Corp.**
4. Equipment Consulting: **HDR.**
5. Cost Estimating: **Palacio Collaborative.**

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. Overview: Development of approximately 6.7 acres at the Duplin County Airpark for the North Carolina Forest Service, including site work, Administration Building, and Maintenance Building.
 1. Site Work includes clearing, grading, utilities, gravel maintenance yard, paving, and perimeter fencing. Site includes fire pump and storage tank, propane farm, and limited development for future covered storage building and fuel station (NIC).
 2. The Administration Building is a new, approximately 9,000-square foot, single-story pre-engineered metal building structure accommodating the North Carolina Forest Service Region 1 Headquarters office, training, and command center functions, and the North Carolina Forest Service Duplin County office. Design includes ribbed metal panel skins, concrete floor slab, interior millwork and finishes, plumbing, mechanical systems, electrical systems, lighting, fire protection systems, and audio-visual equipment.
 3. The Maintenance Building is a new single-story pre-engineered metal building with mezzanine and covered exterior storage canopy. Interior space will be approximately 10,000 square feet with 4 vehicle maintenance bays, a fabrication shop, lube area, parts room, warehouse, small open office/break area, and 1,800-square foot parts storage mezzanine. Design includes ribbed metal panel skins, concrete floor slab, interior millwork and finishes, plumbing, mechanical systems, electrical systems, lighting, fire protection systems, and audio-visual equipment.
- B. Type of Contract: Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

- A. Construct the Work in a single phase.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A. The Owner reserves the right to perform work or to contract portions of the Work separately from the General Contract.
- B. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.
 1. **Furniture:** A separate contract will be awarded for furniture and furnishings.
 2. **Data/Voice Cabling:** A separate contract will be awarded for data/voice cabling. Data/voice infrastructure is included in the project scope of work.
- C. The Contractor shall be responsible for sequencing and schedule of work by others into the overall work schedule and for the coordination between trades of his subcontractors and the Owner's separate contractors.

1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OF/CI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide for delivery of Owner-furnished products to Project site.
2. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Receive, unload, handle, store, protect, and install Owner-furnished products.
2. Make building services connections for Owner-furnished products.
3. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
4. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OF/CI) Products:

1. Existing exterior building signage that may be removed from the existing Region 1 Headquarters and reinstalled at the new Duplin County headquarters facility.

1.8 OWNER-FURNISHED/OWNER-INSTALLED (OF/OI) PRODUCTS

- A. Owner will furnish (and may install) portions of the shop equipment. Work includes providing support systems to receive Owner's equipment.

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

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

- B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, employee parking areas, 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 for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1. Contractor to confirm condition of existing grounds prior to beginning construction. By proceeding with the construction, the Contractor accepts the condition of the grounds. Any issues with the condition of the grounds prior to construction must be addressed to the Owner in writing.

1.10 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.

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

- B. On-Site Work Hours: Limit work to between 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: Coordinate with Owner.
 - 2. Early Morning Hours: Coordinate with Owner.
 - 3. Work in Existing Building: Coordinate with Owner and other applicable Sections of these Specifications.
 - 4. Hours for Utility Shutdowns: Coordinate with Owner and other applicable Sections of these Specifications.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than **two days** in advance of proposed utility interruptions.
 - 2. Proposed utility interruptions may also require coordination and advance notice to the Duplin County Airpark.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC MasterFormat numbering system.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 011000

SECTION 012100 - 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.
- B. Division 1 Specification Section 012200 – Unit Prices for Unit Price Allowances.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Certain 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. This Section include the following unit price allowances:
 - 1. Unit-Cost Allowances.
- C. Related Sections include the following:
 - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Division 1 Section "Unit Prices" for procedures for using unit prices and additional unit price based allowances.
 - 3. Division 2 through 33 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when final selection and purchase of each product or system described as an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposal 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 Owner and 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 actual quantities of materials delivered to the site for use in fulfillment of each allowance.

- C. Coordinate and process submittals for allowance items in the same manner as for other portions of the Work.

1.5 COORDINATION AND 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.
- B. Furnish templates as required to coordinate installation.

1.6 UNIT-COST ALLOWANCES

- A. Allowances shall include cost to Contractor of specific products and materials ordered by the Owner under allowance and shall include taxes, freight, and delivery to Project site.
- B. Contractor's cost for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Credit unused amount of Allowances (if any) to Owner by Change Order at Project Closeout
- D. Administration of Sitework Unit Price Allowances
 - 1. Excavation of work under unit price allowances must be authorized in advance by the Owner, Owner's Geotechnical Testing Firm, and the Architect.
 - 2. Unit Prices for each allowance shall be given on the Bid Form
 - a. The Owner reserves the right to negotiate said Unit Prices prior to the award of Contract
 - 3. Allowance required by this Section shall be included in the Base Bid amount.
 - 4. Allowances required by this Section shall be indicated on the Schedule of Values and shall be determined by multiplying the quantity indicated by the Unit Price given on the Bid Form.
 - 5. Submit invoices or surveyor's certificate, as required, with pay requests that involve Unit Price Allowances.
 - 6. Credit unused amount of Unit Price Allowance (if any) to Owner by Change Order at Project Closeout

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

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:** Unsuitable soils removal in Open Areas, off-site disposal, and replacement with off-site Suitable Fill Soil in Open Areas.
1. Allowance: **2,000-CY**.
 2. Coordinate quantity allowance adjustment with unit price requirements of Division 01 Section "Unit Prices."
 3. The above allowance shall be added to the **Base Bid**.
- B. **Allowance No. 2:** Unsuitable soils removal in Trenches and/ or Pits, disposal off-site, and replacement with off-site Suitable Fill Soil in Trenches and / or Pits.
1. Allowance: **200-CY**.
 2. Coordinate quantity allowance adjustment with unit price requirements of Division 01 Section "Unit Prices."
 3. The above allowance shall be added to the **Base Bid**.
- C. **Allowance No. 3:** Unsuitable soils removal in Open Areas, disposal off-site and replacement with off-site Aggregate Base Course NCDOT CABC stone.
1. Allowance: **1,000-CY**.
 2. Coordinate quantity allowance adjustment with unit price requirements of Division 01 Section "Unit Prices."
 3. The above allowance shall be added to the **Base Bid**.
- D. **Allowance No. 4:** Unsuitable soils removal in Trenches and Pits, disposal off-site, and replacement with off-site Aggregate Base Course NCDOT CABC stone.
1. Allowance: **200-CY**.
 2. Coordinate quantity allowance adjustment with unit price requirements of Division 01 Section "Unit Prices."
 3. The above allowance shall be added to the **Base Bid**.
- E. **Allowance No. 5:** Biaxial Triax Geo-Grid in place.
1. Allowance: **5,000-SY**.
 2. Coordinate quantity allowance adjustment with unit price requirements of Division 01 Section "Unit Prices."
 3. The above allowance shall be added to the **Base Bid**.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

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 unit prices.
- B. Related Sections include the following:
 - 1. Division 1 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.
 - 2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 3. Division 1 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. 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.

1.4 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.
- E. Unit Prices shall be given on the Bid Form. The Owner reserves the right to negotiate said Unit Prices prior to the award of Contract.

- F. Submit invoices or surveyor's certificate, as required, with pay requests that involve Unit Price allowances.
- G. Credit unused amount of Unit Price allowances (if any) to Owner by Change Order at Project Closeout.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ADMINISTRATION OF SITEWORK UNIT PRICE ALLOWANCES

- A. Excavation of work under unit price allowances must be authorized in advance by the Owner, Owner's Geotechnical Testing Firm, and the Architect.
- B. Unit Prices for each allowance shall be given on the Bid Form.
- C. The Owner reserves the right to negotiate said Unit Prices prior to the award of Contract.
- D. Allowances required by this Section shall be included in the Base Bid amount.
- E. Allowances required by this Section shall be indicated on the Schedule of Values and shall be determined by multiplying the quantity indicated by the unit price given on the Bid Form.
- F. Submit invoices or surveyor's certificate, as required, with pay requests that involve the Unit Price Allowances.
- G. Credit unused amount of Unit Price Allowance (if any) to Owner by Change Order at Project Closeout.

3.2 LIST OF UNIT PRICES

- A. **Unit Price No. 1:** Unsuitable soils removal in Open Areas, off-site disposal, and replacement with off-site Suitable Fill Soil in Open Areas.
 - 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Refer to Division 31 Section "Earth Moving."
 - 3. Unit of measurement: cubic yard.
 - 4. Include the following in the unit price:
 - a. Excavation, loading, transport, and disposal of unsuitable soil materials.
 - b. Suitable soil material from off-site source.
 - c. Excavation, loading, transport, placement, and compaction of Suitable Soil.
 - d. Overhead and profit.
 - 5. Include all other related costs in the contract sum.
 - 6. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.
- B. **Unit Price No. 2:** Unsuitable soils removal in Trenches and/ or Pits, disposal off-site, and replacement with off-site Suitable Fill Soil in Trenches and / or Pits.
 - 1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 - 2. Unit of measurement: cubic yard in place prior to excavation.
 - 3. Include the following in the unit price:

- a. Excavation, loading, transport, and disposal of unsuitable soil materials.
 - b. Suitable soil material from off-site source.
 - c. Excavation, loading, transport, placement, and compaction of Suitable Soil.
 - d. Overhead and profit.
 4. Include all other related costs in the contract sum.
 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.
- C. **Unit Price No. 3:** Unsuitable soils removal in Open Areas, off-site disposal, and replacement with off-site Aggregate Base Course (ABC) stone in Open Areas.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Refer to Division 31 Section "Earth Moving."
 3. Unit of measurement: cubic yard.
 4. Include the following in the unit price:
 - a. Excavation, loading, transport, and disposal of unsuitable soil materials.
 - b. ABC material from off-site source.
 - c. Excavation, loading, transport, placement, and compaction of ABC materials.
 - d. Overhead and profit.
 5. Include all other related costs in the contract sum.
 6. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.
- D. **Unit Price No. 4:** Unsuitable soils removal in Trenches and Pits, disposal off-site, and replacement with off-site Aggregate Base Course (ABC) stone.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Unit of measurement: cubic yard in place prior to excavation.
 3. Include the following in the unit price:
 - a. Excavation, loading, transport, and disposal of unsuitable soil materials.
 - b. ABC material from off-site source.
 - c. Excavation, loading, transport, placement, and compaction of ABC materials.
 - d. Overhead and profit.
 4. Include all other related costs in the contract sum.
 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.
- E. **Unit Price No. 5:** Biaxial Geo-Grid in place.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Unit of measurement: square yard installed excluding overlap.
 3. Include the following in the unit price:
 - a. Materials and transport to site.
 - b. Unloading, handling, and placement.
 - c. Overhead and profit.
 4. Include all other related costs in the contract sum.
 5. Method of measurement: Quantities will be verified by a soils and materials engineer employed by the Owner.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. A. Drawings and general provisions of 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 Alternates.
- B. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.
- C. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.
- D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.
- E. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.
 - 1. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. **Alternate No. G-1:** Provide Building 02-Maintenance Building Covered Storage Extension, including all associated equipment, architectural, structural, plumbing, mechanical, electrical, and fire protection systems.
- B. **Alternate No. G-2:** Provide Owner Preferred Alternate for Door Hardware in Both Buildings.
- C. **Alternate No. C-1:** Extend Sitework, including grading, clearing, gravel, perimeter fencing, and site lighting. Add mow strip under all perimeter fencing.

- D. **Alternate No. E-1:** Alternate to provide shop drawings, installation, testing, and Owner training of a Bi-Directional Antenna System (BDA) in Building 01-Administration Building.

NOTE: Base Bid includes surveying and mapping the emergency responder radio signal strength, registered design professional review, evaluation report preparation, and report submittal for Building 01-Administration Building to the Duplin County Fire Marshall.

- E. **Alternate No. E-2:** Alternate to provide shop drawings, installation, testing, and Owner training of a Bi-Directional Antenna System (BDA) in Building 02-Maintenance Building.

NOTE: Base Bid includes surveying and mapping the emergency responder radio signal strength, registered design professional review, evaluation report preparation, and report submittal for Building 02-Maintenance Building to the Duplin County Fire Marshall.

END OF SECTION 012300

SECTION 012500 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. General Conditions and Supplementary General Conditions for requirements for substitution requests prior to award of Contract.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 012600 "Contract Modification Procedures" for requirements for incorporating Contractor's substitution requests into the Contract Documents.
 - 4. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

- e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners, when requested.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **seven** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.

- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 012500

SECTION 012600 - CONTRACT 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications.

1.3 MINOR CHANGES IN THE WORK

- 1. Designer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment of the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Designer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Designer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Proposal Request Form: **North Carolina Department of Administration form OC-24.**
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Designer.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Designer will issue a Change Order for signatures of Owner and Contractor on **North Carolina Department of Administration Form OC-24**.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Designer may issue a Construction Change Directive as **outlined in North Carolina Office of State Construction Administrative Procedures**. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.8 SUBSTITUTIONS FOR CONVENIENCE: NOT ALLOWED.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 012600

SECTION 012900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
 - 5. Articles 31 and 32 of the General Conditions for payment procedures.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEUDLE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Designer at earliest possible date, but no later than **seven** days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.

- e. Contractor's name and address.
- f. 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 the 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 of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
- 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts where appropriate.
- 4. 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.
- 5. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
- 6. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 7. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements.
- 9. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive. Submit updated Schedule of Values prior to subsequent Application for Payment.
- 10. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 11. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Designer and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
1. Where date for submittal or period covered is not listed in the conditions of the Contract: Submit Application for Payment to Designer by the **5th** day of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**.
 2. Submit draft copy of Application for Payment **seven** days prior to due date for review by Architect.
- C. Payment Application Times: The date for each progress payment is the 5th 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 before the date for each progress payment
- D. Application for Payment Forms: Use **AIA Document G702 and AIA Document G703** as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Designer will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed by last day of construction period covered by application.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit **three** signed and notarized original copies of each Application for Payment to Designer] by a method ensuring receipt **within 24 hours**. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
 16. Initial settlement survey and damage report, where required.
- J. Application for Payment at Substantial Completion: After Designer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures" and as outlined in the General Conditions of the Contract.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Certification of completion of final punch list items.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Updated final statement, accounting for final changes to the Contract Sum.
 5. AIA Document G706.
 6. AIA Document G706A.
 7. AIA Document G707.
 8. Evidence that claims have been settled.
 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Project Meetings.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Owner, Designer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATION SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within **15 days** of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, telephone numbers (including mobile and office numbers), and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project in:
 - a. Project meeting room.
 - b. Temporary field office.
 - c. Web-based Project software directory, if used.
 - d. Prominent location in each built facility.
 - e. Location visible from each temporary telephone..
 2. Keep list current at all times.
- C. Federal Aviation Administration (FAA) CFR Title 14 Part 77.9 (Construction or Alteration Requiring Notice) Submittal: Due to the proximity to the Duplin County Airport (DPL) and its associated runway, a Title 14 Part 77.9 advance notice of construction activities (including the use of construction cranes) will need to be submitted to the FAA prior to starting construction activities. Application must be filed with the FAA at least 45 days prior to construction.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

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

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Method: Prepare coordination drawings with sufficient detail to represent content outlined above using one of the following methods:
 - a. Individual drawings submitted in **PDF** format.
 - b. Single BIM file incorporating three-dimensional component information and submitted in **IFC** format.
- B. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 2. Route coordination drawing files sequentially through trades in an order appropriate for size and complexity of trade elements and construction.
 3. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Designer to review and resolve conflicts on the coordination drawings.
- 1.7 REQUEST FOR INFORMATION (RFI)
- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI.
1. Designer will return without response those RFIs submitted to Designer by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Owner name.
 3. Owner's Project number.
 4. Name of Architect.
 5. Date.
 6. Name of Contractor.
 7. RFI number, numbered sequentially.

8. RFI subject.
 9. Specification Section number and title and related paragraphs, as appropriate.
 10. Drawing number and detail references, as appropriate.
 11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 13. Contractor's signature.
 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow **seven** days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **5** days of receipt of the RFI response.
- D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Include the following:
1. Project name and number.
 2. Name and address of Contractor.
 3. RFI number, including RFIs that were returned without action or withdrawn.
 4. RFI description.
 5. Date the RFI was submitted.
 6. Date Designer's response was received.
 7. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- E. On receipt of Designer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Designer within **seven days** if Contractor disagrees with response.
- 1.8 PROJECT MEETINGS
- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15 days** after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, State Construction Office, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software, where proposed.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for disruptions and shutdowns.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions and recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Designer, but no later than **60 days** prior to the scheduled date of Substantial Completion or at **80%** project completion (by project duration from Notice to Proceed to scheduled date of Substantial Completion), whichever is earlier.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.

- d. Submittal of written warranties.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at **monthly** intervals.
- 1. Attendees: In addition to representatives of Owner and Designer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Coordination items.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.

3. Minutes: **Designer** will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Unusual event reports.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.
 - 2. Section 013100 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Section 013233 "Photographic Documentation" for construction photograph requirements.
 - 4. Section 013300 "Submittal Procedures" for submittal requirements and submittals schedule.
 - 5. Section 014000 "Quality Requirements" for schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATION SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
- B. Startup construction schedule.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.

3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at monthly intervals.
- H. Material Location Reports: Submit at monthly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Unusual Event Reports: Submit at time of unusual event.
- K. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than **20 days**, unless specifically allowed by Designer.
 - 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
 - 3. Procurement Activities: Include procurement process activities for long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 5. Startup and Testing Time: Include no fewer than **10 days** for startup and testing.
 - 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Designer's administrative procedures necessary for certification of Substantial Completion.
 - 7. Punch List and Final Completion: Include not more than **30 days** for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.

- d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
- 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
- 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Acceptance, and the following interim milestones:
 - 1. Temporary enclosure and space conditioning.
 - 2. Final Inspections.
- F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.

- H. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Final Completion percentage for each activity.
- I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- J. Distribution: Distribute copies of approved schedule to Designer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.8 CPM SCHEDULE REQUIREMENTS

- A. Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within **14 days** of date established for the Notice to Proceed. Outline significant construction activities for the first **60 days** of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than **30 days** after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Punch list and Final Completion.
 - k. Activities occurring following Final Completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Designer's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable).
 - a. Each activity cost shall reflect an appropriate value subject to approval by Designer.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts **one week** before each regularly scheduled progress meeting.

1.9 REPORTS

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

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

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include

with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within **one day** of an occurrence. Distribute copies of report to Designer and other parties affected by the occurrence.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final Completion construction photographs.
 - 5. Preconstruction video recordings.
 - 6. Periodic construction video recordings.
 - 7. Construction webcam.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 2. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.
 - 3. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATION SUBMITTALS

- A. Key Plan: Where appropriate for clarity, submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within **three days** of taking photographs.
 - 1. Submit photos by uploading to web-based file share or site or Project management software site. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description:
 - a. Name of Project.
 - b. Name of Contractor.
 - c. Date photograph was taken.
 - d. Description of location, vantage point, and direction.
 - e. Unique sequential identifier keyed to accompanying key plan.

- C. Video Recordings: Submit video recordings within **seven days** of recording.
 - 1. Submit video recordings by uploading to web-based file share or site or Project management software site. Include copy of key plan indicating each video's location and direction.
 - 2. Identification: With each submittal, provide the following information:
 - a. Name of Project.
 - b. Name of Contractor.
 - c. Date video recording was recorded.
 - d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 QUALITY ASSURANCE

- A. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with an image resolution of not less than **3200 by 2400** pixels. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera capable of recording in full high-definition mode. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time from camera.

1.6 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take sufficient number of photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take sufficient number of photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

- C. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Underground utilities.
 - 2. Underslab services.
 - 3. Piping.
 - 4. Electrical conduit.
 - 5. Waterproofing and weather-resistant barriers.
- D. Periodic Construction Photographs: Take at least **20** photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Final Completion Construction Photographs: Take at least **20** photographs after date of Final Acceptance for submission as Project Record Documents. Designer will inform photographer of desired vantage points.

1.7 CONSTRUCTION WEBCAM

- A. Webcam: Provide one fixed-location camera(s) with weatherproof housing, mounted to provide unobstructed view of construction site from location approved by Architect, with the following characteristics:
 - 1. Remotely controllable view with mouse-click user navigation for horizontal pan, vertical tilt, and optical zoom of 500 percent minimum.
 - 2. Capable of producing minimum 8-megapixel images.
 - 3. Provide pole mount, power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.
- B. Live Streaming Images: Provide web-accessible image of current site image, updated at 15 minute intervals during daytime operation.
- C. Web-Based Interface: Provide online interface to allow viewing of each high-definition digital still image captured and stored during construction, from the Internet.
 - 1. Access Control: Provide password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.
 - 2. Software: Provide responsive software interface for use on computer, tablet, and mobile screens with accompanying iPhone/iPad app and Android apps.
 - 3. Storage: Maintain images on the website for reference during entire construction period, and for not less than 30 days after Final Completion. Provide sufficient memory on remote server to store all Project images.
 - 4. Online Interface: Provide website interface with Project and client information and logos, calendar-based navigation interface for selecting images, and pan and zoom capability within high-definition images.
 - 5. Forward and Reverse: Provide capability to browse through images, moving forward and backward in time by individual image and by day.
 - 6. Slideshow: Provide capability to automatically display current images from sites when there are three or more cameras used.
 - 7. Time-Lapse: Provide capability for online display of project time-lapse.
 - 8. Dashboard: Provide capability to view thumbnails of all cameras on one screen.

9. Weather: Provide corresponding weather data for each image captured.
- 1.8 Maintain cameras and web-based access in good working order, according to web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of cameras and related networking devices and software.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
 - 5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Designer's action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Designer's action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when

establishing dates. Include additional time required for making corrections or revisions to submittals noted by Designer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Designer's final release or approval.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Designer on previous submittals. Highlight, encircle, or otherwise indicate on each submittal or noting on attached separate sheet.

- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- B. Submit submittals using one of the following methods.
 - 1. Email: Prepare submittals as PDF package and transmit to Architect via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 - 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 - 3. Paper: Where submittal includes physical material samples for approval or selection, prepare submittals in paper form and deliver to Architect with samples.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction and design activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow **20 calendar days** for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Designer will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow **20 calendar days** for review of each resubmittal.
 - 4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow **20 calendar days** for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

- E. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- G. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. **Product Data:** Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's written recommendations.
 - d. Manufacturer's installation instructions.
 - e. Standard color charts.
 - f. Statement of compliance with specified referenced standards.
 - g. Compliance with recognized trade association standards.
 - h. Compliance with recognized testing agency standards.
 - i. Application of testing agency labels and seals.
 - j. Notation of coordination requirements.
 - k. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. **Shop Drawings:** Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Standard information prepared without specific reference project is not a shop drawing.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.

- b. Schedules.
 - c. Dimensions.
 - d. Fabrication and installation drawings.
 - e. Roughing-in and setting diagrams.
 - f. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - g. Shopwork manufacturing instructions.
 - h. Templates and patterns.
 - i. Schedules.
 - j. Design calculations.
 - k. Compliance with specified standards.
 - l. Notation of coordination requirements.
 - m. Notation of dimensions established by field measurement.
 - n. Relationship and attachment to adjoining construction clearly indicated.
 - o. Seal and signature of professional engineer if specified.
 - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- C. **Samples:** Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials and elements.
- 1. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - 2. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 - 3. Identification:
 - a. Permanently attach label on unexposed side of Samples that includes the following:
 - 1) Generic description of Sample.
 - 2) Product name and name of manufacturer.
 - 3) Sample source.
 - b. On affixed label described above, or on separate attached label for submittals including multiple samples, include the following:
 - 1) Project name and submittal number.
 - 2) Number and title of applicable Specification Section.
 - 4. Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 - 5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Designer will return submittal with options selected.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Designer will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. **Product Schedule:** As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. **Qualification Data:** Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. **Design Data:** Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. **Maintenance Data:** Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Closeout Procedures".
- H. **Manufacturer's Instructions:** Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installation and operation of product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following as applicable:
 1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- I. **Certificates:**

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

J. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Designer.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 DESIGNER'S REVIEW

- A. Action Submittals: Designer will review each submittal, indicate corrections or revisions required, and return.
 - 1. Designer will indicate, via markup on each submittal, the appropriate action and stamp appropriately.
- B. Informational Submittals: Designer will review each submittal and will not return it, or will return it if it does not comply with requirements. Designer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Designer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Designer will return without review or discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Designer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- C. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
 - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

- 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Designer.

1.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the

minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Contractor's quality-control personnel.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Reports: Prepare and submit certified written reports and documents as specified.
- D. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of technical representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement of whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.

- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement of whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of North Carolina where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Designer.
 - 3. Notify Designer **seven days** in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Designer's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow **seven days** for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Designer's preliminary review, to the satisfaction of the Designer, before completion of final mockup.
 - 8. Approval of mockups by the Designer does not constitute approval of deviations from the Contract Documents contained in mockups unless Designer specifically approves such deviations in writing.
 - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 10. Demolish and remove mockups when directed unless otherwise indicated.
- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Designer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Designer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:
 - 1. Notifying Designer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 2. Submitting a certified written report of each test, inspection, and similar quality-control service to the Architect of Record, Structural Engineer of Record, and the Office of State Construction, with copy to Contractor and other authorities having jurisdiction.
 - 3. Reports shall include, at a minimum, the following information:
 - a. Project name and location.
 - b. State Construction Office Project ID #.
 - c. Date of inspection.
 - d. Time of inspection.
 - e. Area inspected.
 - f. Date of report.
 - g. Inspector and inspection company.
 - h. Inspector signature with date.
 - i. Contractor initials with date.
 - j. Type of inspection.
 - k. Designation for continuous or periodic inspection.
 - l. List of tests performed.
 - m. Discrepancies observed.
 - n. Corrections performed while on site.
 - o. Statement indicating whether Work was performed in accordance with the Contract Documents, except as noted.
 - p. Supporting data and materials such as lab reports, photos, sketches, etc.
 - q. Statement of Special Inspections (on Form included in Project Manual).
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for reference during normal working hours.
 - 1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document cutting and patching requirements in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014100-SPECIAL INSPECTIONS AND STRUCTURAL TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the North Carolina Building Code.
- B. The program of Special Inspection and Structural Testing is a Quality Assurance program intended to ensure that the work is performed in accordance with the Contract Documents
- C. This specification section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Special Inspector, Testing Company/Testing Laboratory, and other Agents of the Special Inspector of their requirements and responsibilities.

1.3 SCHEDULE OF INSPECTIONS AND TESTS

- A. Required inspections and tests are described in the attached Schedule of Special Inspections and in the individual Specification Sections for the items to be inspected or tested.

1.4 QUALIFICATIONS

- A. The Special Inspector shall be a licensed Professional Engineer who is approved by the Structural Engineer of Record (SER) and Building Official.
- B. The Testing Company/Testing Laboratory and individual technicians shall be approved by the Structural Engineer of Record (SER) and Building Official.
- C. The Testing Company/Testing Laboratory shall retain a full-time licensed Professional Engineer on staff who shall certify all test reports. The Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.
 - 1. Special Inspections of soils and foundations may be performed by inspectors with an education and background in geotechnical engineering in lieu of a background in structural engineering.
 - 2. Technicians performing sampling and testing of concrete shall be ACI certified Concrete Field Testing Technicians-Grade 1.
 - 3. Inspectors performing inspections of concrete work such as inspections of concrete placement, batching, reinforcing placement, curing and protection, may be ACI certified Concrete Construction Inspectors or ICBO certified Reinforced Concrete Special Inspector in lieu of being a licensed PE or EI.
 - 4. Inspectors performing inspections of pre-stressed concrete work may be ICBO/BOCA/SBCCI certified Pre-stressed Concrete Special Inspector.

5. Inspectors performing inspections of masonry may be ICBO certified Structural Masonry Special Inspector.
6. Technicians performing visual inspection of welding shall be AWS Certified Welding Inspectors or ICBO certified Structural Steel and Welding Special Inspectors, technicians performing non-destructive testing such as ultrasonic testing, radiographic testing, magnetic particle testing, or dye-penetrant testing shall be certified as an ASNT-TC Level II or Level III technician.
7. Inspectors performing inspections of spray fireproofing may be ICBO certified Spray- Applied Fireproofing SpecialInspector.
8. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate either by oral or written examination competence for the test to be conducted. They shall be under the supervision of a licensed Professional Engineer and shall not be permitted to independently evaluate test results.

1.5 SUBMITTALS

- A. The Special Inspector and Testing Company/Testing Laboratory shall submit to the SER and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing Company/Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

1.6 PAYMENT

- A. The Owner shall engage and pay for the services of the Special Inspector, Agents of the Special Inspector or Testing Company/Testing Laboratory.
- B. If any materials which require Special Inspections are fabricated in a plant which is not located within 150 miles of the project, the Contractor shall be responsible for the travel expenses of the Special Inspector of Testing Company/Testing Laboratory.
- C. The Contractor shall be responsible for the cost of any retesting or re-inspection of work which fails to comply with the requirements of the Contract Documents.

1.7 CONTRACTOR RESPONSIBILITIES

- A. The Contractor shall cooperate with the Special Inspector and his agents so that the Special Inspections and testing may be performed without hindrance.
- B. The Contractor shall review the Statement of Special Inspections and shall be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the Structural Engineer of Record, Special Inspector or Testing Company/Testing Laboratory at least 48 hours in advance of a required inspection or test. Uninspected work that required inspection may be rejected solely on that basis.
- C. The Contractor shall complete the attached Contractor Statement of Responsibility and submit to owner with the signed contracts.

- D. The Contractor shall provide the form for the Final Report of Special Inspections to the Special Inspector for completion at the completion of the project.
- E. The Statement of Special Inspections will be completed by the Structural Engineer of Record and the Owner and provided to the Contractor after the contracts are signed and returned to the Owner. The Contractor shall submit the completed Statement of Special Inspections to the Building Official for acceptance at the time the building permit is applied for.
- F. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- G. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved shop drawings, and specifications for use by the inspectors and testing technicians.
- H. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program. All work that is to be subjected to Special Inspections shall first be reviewed by the Contractor's quality control personnel.
- I. The Contractor shall be solely responsible for construction site safety.

1.8 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing Company/Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Company/Testing Laboratory will not have control over the Contractor's means or methods of construction.
- C. The Special Inspector or Testing Company/Testing Laboratory shall not be responsible for construction site safety.
- D. The Special Inspector or Testing Company/Testing Laboratory has no authority to stop the work.

1.9 STATEMENT OF SPECIAL INSPECTIONS

- A. The Statement of Special Inspections will be prepared by the Structural Engineer of Record.
- B. The attached Statement of Special Inspections shall be used.
- C. The Statement of Special Inspections shall be provided to the Contractor after the contracts are signed and returned to the Owner and shall be submitted with the application of Building Permit.

1.10 RECORDS AND REPORTS

- A. Detailed daily reports shall be prepared of each inspection or test and submitted to the Special Inspector. Reports shall include:

1. Date of Test or Inspection
 2. Name of Inspector or Technician
 3. Location of Specific Areas Tested or Inspected
 4. Description of Test or Inspection and Results
 5. Applicable ASTM Standard
 6. Weather Conditions
 7. Engineer's Seal and Signature
- B. The Special Inspector shall submit interim reports to the Building Official at the end of each month which include all inspections and test reports received last week. Copies shall be sent to the SER, Architect and Contractor.
- C. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor. If the discrepancies are not corrected, the Special Inspector shall notify the SER and Building Official. Reports shall document all discrepancies identified and the correction action taken.
- D. The Testing Company/Testing Laboratory shall immediately notify the Special Inspector and the SER by telephone, fax, or electronic mail any test results which fail to comply with the requirements of the Contract Documents.
- E. Reports shall be submitted to the Special Inspector within 7 days of the inspection or test. Legible handwritten reports may be submitted if final typed copies are not readily available. Formal reports shall follow.
- F. At the completion of the work requiring Special Inspections, each inspection agency and Testing Company/Testing Laboratory shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.11 FINAL REPORT OF SPECIAL INSPECTIONS

- A. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the SER and Building Official prior to the issuance of a Certificate of Use and Occupancy.
- B. The attached Final Report of Special Inspections shall be used.
- C. The Final Report of Special Inspections will certify that all required inspections have performed and will itemize any discrepancies that were not corrected or resolved.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

Statement of Special Inspections

Project: North Carolina Forest Service Region-1 Headquarters

Location: 260 Airport Road, Kenansville, NC 28349

Owner's Representative: Andrew Meier, NC Dept of Agriculture & Consumer Services

Owner's Address: 2 West Edenton Street, Raleigh, NC 27601

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the 2018 North Carolina State Building Code. It includes a Schedule of Special Inspection Services applicable to this project, the name of the Special Inspector, the identity of other approved agencies retained for conducting Special Inspections, and the required inspector qualifications. This Statement of Special Inspections was prepared by the following Designers of Record:

Structural	Brian M. Ross, PE		
	(Type or print name)	(Signature)	(Date)
Architectural			
	(Type or print name)	(Signature)	(Date)
Mechanical			
	(Type or print name)	(Signature)	(Date)
Other			
	(Type or print name)	(Signature)	(Date)

The Special Inspector shall keep records of all special inspections and tests and shall furnish reports to the State Construction Office and the Designers of Record. Reports shall indicate if the work inspected or tested was or was not completed in conformance with the approved construction documents. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the State Construction Office and the Designers of Record. The Special Inspections program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the State Construction Office, Owner, and the Designers of Record.

Interim Report Frequency: **Monthly**

A Final Report of Special Inspections documenting completion of all required Special Inspections, testing, and correction of any discrepancies should be submitted prior to issuance of a Certificate of Use and Occupancy.

Job Site safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Authorization

Accepted for the SCO by:

Signature

Date

Signature

Date

Schedule of Special Inspection Services^a

The following sheets comprise the required schedule of special inspections for this project. The construction divisions which require special inspections for this project are as follows.

- | | |
|--|--|
| <input checked="" type="checkbox"/> Structural Steel & High Strength Bolting | <input type="checkbox"/> Helical Pile Foundations |
| <input type="checkbox"/> Welding of Structural Steel | <input type="checkbox"/> Rammed Aggregate Piers & Stone Columns |
| <input checked="" type="checkbox"/> Cold-Formed Steel Deck | <input type="checkbox"/> Sprayed Fire-Resistant Material |
| <input type="checkbox"/> Open-Web Steel Joists & Joist Girders | <input type="checkbox"/> Mastic & Intumescent Fire-Resistant Coatings |
| <input type="checkbox"/> Cold-Formed Steel Framing | <input type="checkbox"/> Exterior Insulation & Finish System |
| <input checked="" type="checkbox"/> Concrete Construction | <input type="checkbox"/> Fire-Resistant Penetrations & Joints |
| <input checked="" type="checkbox"/> Masonry Construction ^b | <input type="checkbox"/> Smoke Control |
| <input type="checkbox"/> Wood Construction | <input type="checkbox"/> Retaining Wall & Systems > 5 Feet |
| <input checked="" type="checkbox"/> Soils | <input type="checkbox"/> Special Inspections for Wind Resistance |
| <input type="checkbox"/> Driven Deep Foundations | <input checked="" type="checkbox"/> Special Inspections for Seismic Resistance |
| <input type="checkbox"/> Cast-in-Place Deep Foundations | |

a. The inspection frequency indicated on the following inspection tables are "C" continuous, "P" periodic, & "O" random on a daily basis.

b. Level A is the minimum inspection program for empirically / prescriptively designed masonry in Risk Category I, II or III structures.

Level B is the minimum inspection program for empirically / prescriptively designed masonry in Risk Category IV structures and engineered masonry in Risk Category I, II or III structures. Level C is the minimum inspection program for engineered masonry in Risk Category IV structures. Engineered masonry structures are those designed in accordance with portions of the TMS 402-13 / ACI 530-13/ASCE 5-13 other than Part 4 or Appendix A.

Inspection Agents	Firm Name & Point of Contact	Address / Phone / E-mail
1. Special Inspector (SI-1)		
2. Testing Agency (TA-1)		
3. Testing Agency (TA-2)		
4. Geotechnical Engineer (GE-1)		
5. Other (O-1)		

Note: The inspection and testing agent(s) shall be engaged by the Owner or the Registered Design Professional of Record acting as the Owner's agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the State Construction Office, prior to commencing work.

Seismic Design Category: ☐ A ☐ B ☐ C ☒ D

Basic Wind Speed (V_{asd}): ☐ 90-109mph ☐ 110-119mph ☒ ≥ 120 mph

Wind Exposure Category: ☒ B ☐ C ☐ D

Schedule of Special Inspection Services | **Structural Steel and High-Strength Bolting**

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			AISC 360	NCBC	
1. Fabricator Certification / Verification of Quality Control Procedures					
a. Verify fabricator qualifications	<input checked="" type="checkbox"/>	C		1704.2.5.1	
b. Review material test reports & certifications	<input type="checkbox"/>	C	N5.2		
c. Collect certificates of compliance from the steel fabricator at completion of fabrication	<input type="checkbox"/>	C		1704.5	
2. Inspections Prior to High-Strength Bolting at Pretensioned and Slip-Critical Joints					
a. Collect manufacturer's certifications for fastener materials	<input type="checkbox"/>	C	Table (Tbl) N5.6-1		
b. Fasteners are marked per ASTM requirements	<input type="checkbox"/>	P	Tbl N5.6-1		
c. Ensure correct fasteners and bolting procedures are selected for joint details	<input type="checkbox"/>	P	Tbl N5.6-1		
d. Verify connecting elements, including the appropriate faying surface condition and hole preparation when specified, comply with the construction documents	<input type="checkbox"/>	P	Tbl N5.6-1		
e. Observe and document pre-installation verification testing by installation personal for fastener assemblies and methods	<input type="checkbox"/>	P	Tbl N5.6-1		
f. Verify proper storage provided for all fastener components	<input type="checkbox"/>	P	Tbl N5.6-1		
3. Inspections During High-Strength Bolting at Pretensioned and Slip-Critical Joints					
a. Ensure correct fastener assemblies placed in all holes and washers, when specified, are positioned as required	<input type="checkbox"/>	P	Tbl N5.6-2		
b. Verify joint brought to snug-tight condition prior to pretensioning	<input type="checkbox"/>	P	Tbl N5.6-2		
c. Verify fastener components not turned by the wrench prevented from rotating	<input type="checkbox"/>	P	Tbl N5.6-2		
d. Ensure fasteners are pretensioned in accordance with RCSC, progressing from the most rigid point towards free edges	<input type="checkbox"/>	P	Tbl N5.6-2		
4. Document acceptance or rejection of bolted connections after high-strength bolting is complete	<input checked="" type="checkbox"/>	C	Tbl N5.6-3		
5. Structural Details					
a. Verify diameter, grade, type and length of anchor rods and other embedded items supporting structural steel	<input checked="" type="checkbox"/>	P	N5.7		
b. Inspection of fabricated assemblies & erected steel framing verifying compliance with the construction documents	<input checked="" type="checkbox"/>	P	N5.7		
6. Composite Construction					
a. Verify placement & installation of steel deck	<input type="checkbox"/>	P	Tbl N6.1		
b. Observe placement and installation of steel headed stud anchors			Tbl N6.1		
c. Document acceptance or rejection of composite construction elements	<input type="checkbox"/>	P	Tbl N6.1		

Schedule of Special Inspection Services | **Cold-Formed Steel Deck**

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			SDI QA/QC	NCBC	
1. Prior to deck placement, verify deck and deck accessories comply with the construction documents	<input checked="" type="checkbox"/>	C	Table (Tbl) 1.1		
2. Inspection Tasks After Deck Placement					
a. Verify the installation of deck & deck accessories complies with the construction documents	<input checked="" type="checkbox"/>	C	Tbl 1.2		
b. Verify that deck materials' mill certifications comply with the construction documents	<input type="checkbox"/>	C	Tbl 1.2		
3. Inspection Tasks Prior to Deck Welding					
a. Collect welding procedure specification (WPS)	<input type="checkbox"/>	P	Tbl 1.3		
b. Collect manufacturer certifications for welding consumables	<input type="checkbox"/>	P	Tbl 1.3		
c. Verify material type and grade	<input checked="" type="checkbox"/>	P	Tbl 1.3		
d. Check welding equipment	<input checked="" type="checkbox"/>	P	Tbl 1.3		
4. Inspection Tasks During Deck Welding					
a. Verify welder qualifications	<input type="checkbox"/>	P	Tbl 1.4		
b. Verify proper control and handling of welding consumables	<input type="checkbox"/>	P	Tbl 1.4		
c. Monitor environmental conditions	<input type="checkbox"/>	P	Tbl 1.4		
d. Monitor proper implementation of WPS	<input type="checkbox"/>	P	Tbl 1.4		
5. Inspection Tasks After Welding					
a. Verify size and location of welds, including support, sidelap and perimeter welds	<input checked="" type="checkbox"/>	C	Tbl 1.5		
b. Verify welds meet visual acceptance criteria	<input checked="" type="checkbox"/>	C	Tbl 1.5		
c. Observe weld repair activities	<input type="checkbox"/>	C	Tbl 1.5		
6. Inspection Tasks Prior to Mechanical Fastening					
a. Verify manufacturer installation instructions available for mechanical fasteners	<input type="checkbox"/>	P	Tbl 1.6		
b. Proper tools available for fastener installation	<input type="checkbox"/>	P	Tbl 1.6		
c. Verify proper storage of mechanical fasteners	<input type="checkbox"/>	P	Tbl 1.6		
7. Inspection Tasks During Mechanical Fastening					
a. Observe fastener spacing and position	<input type="checkbox"/>	P	Tbl 1.7		
b. Verify fasteners are installed in accordance with manufacturer's instructions	<input type="checkbox"/>	P	Tbl 1.7		
8. Inspection Tasks After Mechanical Fastening					
a. Check spacing, type and installation of support fasteners	<input type="checkbox"/>	C	Tbl 1.8		
b. Check spacing, type, and installation of sidelap fasteners	<input type="checkbox"/>	C	Tbl 1.8		
c. Check spacing, type, and installation of perimeter fasteners	<input type="checkbox"/>	C	Tbl 1.8		
d. Verify repair activities	<input type="checkbox"/>	C	Tbl 1.8		
9. Document acceptance or rejection of deck & deck accessories for all phases of construction	<input checked="" type="checkbox"/>	C	Tbls 1.1 thru 1.8		

Schedule of Special Inspection Services | **Concrete Construction**

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard ^a	NCBC	
1. Inspect reinforcement, including prestressing tendons, and verify placement	<input checked="" type="checkbox"/>	P	ACI Ch.20, 25.2, 25.3, 26.6.1-26.6.3	1908.4	
2. Reinforcing Bar Welding:			AWS D1.4		
e. Verify weldability of reinforcing bars other than ASTM A706 and collect reports	<input type="checkbox"/>	P	ACI 26.6.4	1704.5	
f. Inspect single-pass fillet welds $\leq 5/16"$	<input type="checkbox"/>	P	ACI 26.6.4		
g. Inspect all welds other than single-pass fillet welds $\leq 5/16"$	<input type="checkbox"/>	C	ACI 26.6.4		
3. Concrete Anchors:					
a. Inspect anchors cast in concrete	<input checked="" type="checkbox"/>	P	ACI 17.8.2		
b. Inspect adhesive anchors installed in hardened concrete with horizontally or upwardly inclined orientations that resist sustained tension loads	<input checked="" type="checkbox"/>	C	ACI 17.8.2.4		
c. Inspect adhesive anchors installed in hardened concrete with orientations different from Item 3.b	<input checked="" type="checkbox"/>	P	ACI 17.8.2		
d. Inspect mechanical anchors installed in hardened concrete	<input checked="" type="checkbox"/>	P	ACI 17.8.2		
4. Collect mix designs and verify the correct mix used during installation	<input checked="" type="checkbox"/>	P	ACI Ch19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3	
5. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete	<input checked="" type="checkbox"/>	C	ASTM C172, ASTM C31, ACI 26.4, 26.12	1908.10	
6. Inspect concrete and shotcrete placement for proper application techniques	<input type="checkbox"/>	C	ACI 26.5	1908.6, 1908.7, 1908.8	
7. Collect reports of preconstruction tests for shotcrete when preconstruction tests are required by NCBC Section 1908.4	<input type="checkbox"/>	C		1704.5, 1908.5	
8. Verify maintenance of specified curing temperature and techniques	<input checked="" type="checkbox"/>	P	ACI 26.5.3-26.5.5	1908.9	
9. Inspections for prestressed concrete					
a. Observe application of prestressing force	<input type="checkbox"/>	C	ACI 26.10		
b. Inspect grouting of bonded prestressing tendons	<input type="checkbox"/>	C	ACI 26.10		
10. Verify concrete strength prior to stressing of PT tendons and prior to removal of shores and forms from PT & mild beams and structural slabs	<input type="checkbox"/>	P	ACI 26.11.2		
11. Inspect erection of precast members	<input type="checkbox"/>	P	ACI 26.8		
12. Inspect formwork for shape, location and dimensions of the concrete member being formed	<input checked="" type="checkbox"/>	P	ACI 26.11.1.2(b)		
13. Collect mill test reports for ASTM A615 rebar used by SFRS special moment frames, special structural walls or coupling beams	<input type="checkbox"/>	C	ACI 20.2.2.5	1704.5	

a. References to "ACI" in this table are to the ACI 318-14.

Schedule of Special Inspection Services | **Masonry - Level B**

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			TMS 402 _a	TMS 602 _a	
1. Test & verify slump flow & visual stability index as delivered to site for self-consolidating grout	<input checked="" type="checkbox"/>	C	Table (Tbl) 3.1.2	Art. 1.5B.1.b.3	
2. Test & verify f'_m & f'_{AAC} prior to construction	<input checked="" type="checkbox"/>	C	Tbl 3.1.2	Art. 1.4B	
3. Verify compliance with the approved submittals	<input checked="" type="checkbox"/>	P	Tbl 3.1.2	Art. 1.5	
4. As masonry construction begins, verify that the following are in compliance:					
a. Proportions of site-prepared mortar	<input checked="" type="checkbox"/>	P		Art. 2.1, 2.6A	
b. Construction of mortar joints	<input checked="" type="checkbox"/>	P		Art. 3.3B	
c. Grade and size of prestressing tendons and anchorages	<input type="checkbox"/>	P		Art. 2.4B, 2.4H	
d. Location of reinforcement, connectors and prestressing tendons and anchorages	<input checked="" type="checkbox"/>	P		Art. 3.4, 3.6A	
e. Prestressing technique	<input type="checkbox"/>	P		Art. 3.6B	
f. Properties of thin-bed mortar at AAC masonry	<input type="checkbox"/>	C / P _b		Art. 2.1C	
5. Prior to grouting, verify that the following comply:					
a. Grout space is clean, and cleanouts provided when required	<input checked="" type="checkbox"/>	P		Art. 3.2D, 3.2F	
b. Grade, type & size of reinforcement & anchor bolts, & prestressing tendons & anchorage	<input checked="" type="checkbox"/>	P	Sec. 6.1	Art. 2.4, 3.4	
c. Placement of reinforcement, connectors, and prestressing tendons and anchorage	<input checked="" type="checkbox"/>	P	Sec. 6.1, 6.2.1, 6.2.6, 6.2.7	Art.3.2E, 3.4, 3.6A	
d. Proportions of site-prepared grout and prestressing grout for bonded tendons	<input checked="" type="checkbox"/>	P		Art. 2.6B, 2.4G.1.b	
e. Construction and size of mortar joints	<input type="checkbox"/>	P		Art. 3.3B	
6. Verify during construction:					
a. Size and location of structural elements	<input checked="" type="checkbox"/>	P		Art. 3.3F	
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	<input checked="" type="checkbox"/>	P	Sec. 1.2.1(e), 6.1.4.3, 6.2.1		
c. Welding of reinforcement	<input type="checkbox"/>	C	Sec. 8.1.6.7.2, 9.3.3.4(c), 11.3.3.4(b)		
d. Preparation, construction, and protection of masonry during cold weather (temperature < 40°F) or hot weather (temperature > 90°F)	<input type="checkbox"/>	P		Art. 1.8C, 1.8D	
e. Application & measurement of prestress force	<input type="checkbox"/>	C		Art. 3.6B	
f. Verify placement of grout and prestressing grout for bonded tendons	<input checked="" type="checkbox"/>	C		Art. 3.5, 3.6C	
g. Placement of AAC masonry units and construction of thin-bed mortar joints	<input type="checkbox"/>	C / P _b		Art. 3.3B.9, 3.3F.1.b	
7. Observe preparation of grout specimens, mortar specimens, and or prisms	<input type="checkbox"/>	P		Art. 1.4.B.2.a.3, 1.4.B.2.b.3, 1.4.B.2.c.3, 1.4.B.3, 1.4.B.4	

a. References to "TMS402" in this table are to the TMS402/ACI530/ASCE5-13. References to "TMS602" are to TMS602/ACI530.1/ASCE6-13.

b. AAC masonry shall be continuously inspected for the first 5000-square feet and periodically inspected afterwards.

Schedule of Special Inspection Services | **Soils**

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agents
			Standard	NCBC	
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity	<input checked="" type="checkbox"/>	P		1705.6	
2. Verify excavations extend to proper depth and have reached the correct soil material	<input checked="" type="checkbox"/>	P		1705.6	
3. Perform classification and testing of compacted fill materials	<input checked="" type="checkbox"/>	P		1705.6	
4. Verify that materials used, densities, lift thickness and procedures used during placement and compaction of compacted fill are in accordance with the approved soils report and the construction documents	<input checked="" type="checkbox"/>	C		1705.6	
5. Prior to placement of compacted fill, verify that the subgrade has been prepared in accordance with the approved soils report and the construction documents	<input checked="" type="checkbox"/>	P		1705.6	

FINAL REPORT OF SPECIAL INSPECTIONS

Project: North Carolina Forest Service Region-1 Headquarters

Location: 260 Airport Road, Kenansville, NC 28349

Owner's Representative: Andrew Meier, NC Dept of Agriculture & Consumer Services

Owner's Address: 2 West Edenton Street, Raleigh, NC 27601

Architect of Record: Paul W. Stewart III, AIA (Williard Stewart Architects, PA)

Structural Engineer of Record: Brian M. Ross, PE (Ross Linden Engineers PC)

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the State of Special Inspections submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections).

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

Licensed Professional Seal

Signature

Date

**FINAL REPORT OF SPECIAL INSPECTIONS
AGENTS FINAL REPORT**

Project: North Carolina Forest Service Region-1 Headquarters

Agent: TBD

Special Inspector: TBD

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections).

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,

Agent of the Special Inspector

Licensed Professional Seal

Signature

Date

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan must submit a Statement of Responsibility.

Project: North Carolina Forest Service Region-1 Headquarters

Contractor's Name: TBD

Address: TBD

License Number: TBD

Description of designated building systems and components included in the Statement of Responsibility:

Soils and Foundations: Slab on Grade Subgrade, Footing Subgrade, Excavations and Compaction.

Cast-in-Place Concrete: Footings, Walls, Piers, Slabs On Grade, Reinforcing, Anchorage.

Masonry: Interior Masonry, Reinforcing and Anchorage.

Structural Steel: Structural Steel and High-Strength Bolting.

Steel Decking: Cold-Formed Steel Deck.

CONTRACTOR'S ACKNOWLEDGMENT OF SPECIAL REQUIREMENTS

I hereby acknowledge that I have received, read, and understand the Quality Assurance Plan and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Building Official.

Signature

Date

CONTRACTOR'S PROVISIONS FOR QUALITY CONTROL

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

FABRICATOR'S CERTIFICATE OF COMPLIANCE

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: North Carolina Forest Service Region-1 Headquarters

Fabricator's Name: TBD

Address: TBD

Certification or Approval Agency: TBD

Certification Number: TBD

Date of Last Audit or Approval: TBD

Description of Structural Members and Assemblies That Have Been Fabricated: TBD

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

Signature

Date

Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
- I. "Provide": Furnish and install, complete and ready for the intended use.
- J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- K. "Experienced": When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of **five** previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 2. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 3. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
 - 4. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 5. AF&PA - American Forest & Paper Association; www.afandpa.org.
 - 6. AGA - American Gas Association; www.aga.org.
 - 7. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 8. AI - Asphalt Institute; www.asphaltinstitute.org.
 - 9. AIA - American Institute of Architects (The); www.aia.org.
 - 10. AISC - American Institute of Steel Construction; www.aisc.org.
 - 11. AISI - American Iron and Steel Institute; www.steel.org.
 - 12. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
 - 13. ANSI - American National Standards Institute; www.ansi.org.
 - 14. APA - Architectural Precast Association; www.archprecast.org.
 - 15. ARI - American Refrigeration Institute; (See AHRI).
 - 16. ASCE - American Society of Civil Engineers; www.asce.org.
 - 17. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
 - 18. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
 - 19. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
 - 20. ASTM - ASTM International; www.astm.org.
 - 21. AWI - Architectural Woodwork Institute; www.awinet.org.
 - 22. AWPA - American Wood Protection Association; www.awpa.com.
 - 23. AWS - American Welding Society; www.aws.org.
 - 24. BIA - Brick Industry Association (The); www.gobrick.com.
 - 25. BICSI - BICSI, Inc.; www.bicsi.org.

26. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
27. CGA - Compressed Gas Association; www.cganet.com.
28. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
29. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
30. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
31. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
32. CPA - Composite Panel Association; www.compositepanel.org.
33. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
34. CRRC - Cool Roof Rating Council; www.coolroofs.org.
35. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
36. CSA - CSA Group; www.csa-group.org.
37. CSI - Construction Specifications Institute (The); www.csiresources.org.
38. CWC - Composite Wood Council; (See CPA).
39. DHI - Door and Hardware Institute; www.dhi.org.
40. ECA - Electronic Components Association; (See ECIA).
41. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
42. ECIA - Electronic Components Industry Association; www.eciaonline.org.
43. EIA - Electronic Industries Alliance; (See TIA).
44. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
45. EVO - Efficiency Valuation Organization; www.evo-world.org.
46. FM Approvals - FM Approvals LLC; www.fmglobal.com.
47. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
48. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridarooft.com.
49. FSA - Fluid Sealing Association; www.fluidsealing.com.
50. FSC - Forest Stewardship Council U.S.; www.fscus.org.
51. GA - Gypsum Association; www.gypsum.org.
52. GANA - Glass Association of North America; (See NGA).
53. HI - Hydraulic Institute; www.pumps.org.
54. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
55. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
56. ICBO - International Conference of Building Officials; (See ICC).
57. ICC - International Code Council; www.iccsafe.org.
58. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
59. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
60. IEC - International Electrotechnical Commission; www.iec.ch.
61. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
62. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
63. IESNA - Illuminating Engineering Society of North America; (See IES).
64. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
65. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
66. ILI - Indiana Limestone Institute of America, Inc.; www.ili.ai.com.
67. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
68. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
69. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.

70. ISO - International Organization for Standardization; www.iso.org.
71. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
72. ITU - International Telecommunication Union; www.itu.int/home.
73. LMA - Laminating Materials Association; (See CPA).
74. LPI - Lightning Protection Institute; www.lightning.org.
75. MBMA - Metal Building Manufacturers Association; www.mbma.com.
76. MCA - Metal Construction Association; www.metalconstruction.org.
77. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
78. MHIA - Material Handling Industry of America; www.mhia.org.
79. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
80. MPI - Master Painters Institute; www.paintinfo.com.
81. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
82. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
83. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
84. NADCA - National Air Duct Cleaners Association; www.nadca.com.
85. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
86. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
87. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
88. NCMA - National Concrete Masonry Association; www.ncma.org.
89. NEBB - National Environmental Balancing Bureau; www.nebb.org.
90. NECA - National Electrical Contractors Association; www.necanet.org.
91. NelMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
92. NEMA - National Electrical Manufacturers Association; www.nema.org.
93. NETA - InterNational Electrical Testing Association; www.netaworld.org.
94. NFPA - National Fire Protection Association; www.nfpa.org.
95. NFPA - NFPA International; (See NFPA).
96. NFRC - National Fenestration Rating Council; www.nfrc.org.
97. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
98. NHLA - National Hardwood Lumber Association; www.nhla.com.
99. NLGA - National Lumber Grades Authority; www.nlga.org.
100. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
101. NRCA - National Roofing Contractors Association; www.nrca.net.
102. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
103. NSF - NSF International; www.nsf.org.
104. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
105. NSPE - National Society of Professional Engineers; www.nspe.org.
106. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
107. PDI - Plumbing & Drainage Institute; www.pdionline.org.
108. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
109. RFCI - Resilient Floor Covering Institute; www.rfci.com.
110. SAE - SAE International; www.sae.org.
111. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
112. SDI - Steel Deck Institute; www.sdi.org.
113. SDI - Steel Door Institute; www.steeldoors.org.
114. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
115. SIA - Security Industry Association; www.siaonline.org.
116. SJI - Steel Joist Institute; www.steeljoist.org.

117. SMA - Screen Manufacturers Association; www.smainfo.org.
 118. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
 119. SSINA - Specialty Steel Industry of North America; www.ssina.com.
 120. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
 121. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
 122. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
 123. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
 124. TMS - The Masonry Society; www.masonrysociety.org.
 125. UL - Underwriters Laboratories Inc.; www.ul.com.
 126. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 127. WA - Wallcoverings Association; www.wallcoverings.org.
 128. WASTEC - Waste Equipment Technology Association; www.wastec.org.
 129. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 130. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 131. WI - Woodwork Institute; www.wicnet.org.
 132. WWPA - Western Wood Products Association; www.wwpa.org.
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 3. ICBO - International Conference of Building Officials; www.icbo.org.
 4. ICC - International Code Council; www.iccsafe.org.
 5. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 5. DOE - Department of Energy; www.energy.gov.
 6. EPA - Environmental Protection Agency; www.epa.gov.
 7. FAA - Federal Aviation Administration; www.faa.gov.
 8. FG - Federal Government Publications; www.gpo.gov/fdsys.
 9. GSA - General Services Administration; www.gsa.gov.
 10. HUD - Department of Housing and Urban Development; www.hud.gov.
 11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
 12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 13. SD - Department of State; www.state.gov.
 14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.

16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
 - 3. Electrical power service.
 - 4. Lighting.
 - 5. Telephone service.
- C. Support facilities include, but are not limited to, the following:
 - 1. Temporary roads and paving.
 - 2. Dewatering facilities and drains.
 - 3. Waste disposal facilities.
 - 4. Field offices.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Environmental protection.
 - 2. Stormwater control.
 - 3. Tree and plant protection.
 - 4. Site enclosure fence.
 - 5. Security enclosure and lockup.
 - 6. Barricades, warning signs, and lights.
- E. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect and Engineers, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within **15 days** of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.

5. Other dust-control measures.

G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
6. Indicate locations of sensitive [research][patient][equipment] <Insert item> areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.5 QUALITY ASSURANCE

- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities." And NFPA 241.
1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
1. Keep temporary services and facilities clean and neat.
 2. Relocate temporary services and facilities as required by progress of the Work.

1.7 STREETS, RIGHT-OF-WAY, PARKING, & PERMIT PLANS

- A. The Contractor shall develop plans for closings of streets, sidewalks, right-of ways, and obtain permits as required by regulatory authorities. All drawings and plans shall be submitted to the designer for approval prior to submittal to regulatory

agencies. Plans developed by the Contractor will show details of all required signage, barricades, fences, gates, and lights, etc.

- B. Contractor shall be responsible for obtaining and erecting street/parking lot signage as necessary to divert traffic away from staging areas, etc. Contractor is to coordinate signage requirements with the Town and Architect. All associated costs are to be borne by the Contractor. Contractor shall provide area for parking for subcontractors, Architect and Owner representatives.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Designer. Provide materials suitable for use intended.
- B. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (2.4 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- C. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- D. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- F. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches (914 by 1524 mm).
- G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units or job-built construction with lockable entrances, serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.

2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
 3. Drinking water and private toilet.
 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Sheds may be open shelters or fully enclosed spaces within building or elsewhere onsite.
 2. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
 3. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- C. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
- D. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- E. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.
- F. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."
- G. Air-Filtration Units: Where required for dust control, primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service.
 - 1. Where utility company provides only part of service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
 - 2. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 - 3. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
 - 4. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
 - a. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
 - b. Connect temporary sewers as directed by sewer department officials.
 - c. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
 - d. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.
- C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are individually metered, cleaned and maintained in a condition acceptable to Owner. At Final Completion, restore these facilities to condition existing before initial use.
 1. Provide rubber hoses as necessary to serve Project site.
 2. Provide temporary hydrant meter and backflow preventer as required by jurisdictional authority.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities will not be permitted.
 2. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 3. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
 5. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
 - a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.
 6. Locate toilets and drinking-water fixtures so personnel need not walk more than two stories vertically or 200 feet horizontally to facilities.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Install electric power service overhead unless otherwise indicated.
 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. Install exterior yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.
 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
- J. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.
- K. Provide portable cellular telephone for Superintendent use in making and receiving telephone calls when away from field office.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 2. Locate storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
 3. Utilize designated area within existing building for temporary field offices.
 4. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Final Acceptance. Personnel remaining after Final Acceptance will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas where possible or coordinate with Owner to locate within construction limits indicated on Drawings.

1. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Provide temporary traffic controls and junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads.
 2. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 3. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Coordinate construction parking areas for construction personnel with Owner and Architect. Use of Duplin County Airport Terminal Parking is not allowed.
- F. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Comply with applicable requirements in Division 31 Specification Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed
 3. Remove snow and ice as required to minimize accumulations.
- H. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Unauthorized signs are not permitted.
1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
 2. Provide temporary, directional signs for construction personnel and visitors.
 3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
 4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
 5. Maintain and touch up signs, so they are legible at all times.

- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
 - 1. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.
 - 2. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- M. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- N. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
- O. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
 - 2. Comply with work restrictions specified in Section 011000 "Summary."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings or authorities having jurisdiction, whichever is more stringent.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Final Acceptance. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- H. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people or animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As indicated or as required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Gates: Provide gates in sizes and at locations appropriate to accommodate delivery vehicles and other construction operations.
 - 3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting. Where needed, provide lighting, including flashing red or amber lights.
- K. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
 - 2. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 3. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
 - 4. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 - 5. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.

- M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 3. Insulate partitions to control noise transmission to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 5. Protect air-handling equipment.
 - 6. Protect air-handling equipment.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, and access routes for firefighting.
 - 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 - 5. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 6. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for **48 hours** are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for **48 hours**. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within **48 hours**.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Final Acceptance.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Final Acceptance Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Final Acceptance Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 2. Section 014200 "References" for applicable industry standards for products specified.
 - 3. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 ACTION SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate Product List with Contractor's Construction Schedule and Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - 3. Initial Submittal: Within **15 days** after date of commencement of the Work, submit initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 - 4. Completed List: Within **30 days** after date of commencement of the Work, submit completed product list. Include a written explanation for omissions of data & for variations from Contract requirements.
 - 5. Architect's Action: Architect will respond in writing to Contractor within **15 days** of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. Comparable Product Request: Submit request for consideration of each comparable product.
 - 1. Include:
 - a. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - b. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of

proposed comparable product request within **15 days** of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Basis-of-Design Product Specification: Comply with requirements in Section 013300 "Submittal Procedures."
- D. Substitution Request: Comply with requirements in Section 012500 "Substitution Procedures".

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.6 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.
 4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 7. Protect stored products from damage and liquids from freezing.
 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.8 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Warranty Period: The date of Final Acceptance will establish the beginning of the guarantees and warranties period for all warranties.
- D. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Designer will make selection.
 - 5. Where products are accompanied by the term "match sample", sample to be matched is Designer's.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 7. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Designer in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Designer, whose determination is final.
- B. Product Selection Procedures:
 - 1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
 - 2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 - 3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 - 4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

- a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the selected product to match a sample, typically including the phrase "match Architect's sample" or "match Designer's sample," provide a product that complies with requirements and matches the indicated sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that *includes both standard and premium items*.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the product named in the Specification. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION [NOT USED]

END OF SECTION 016000

SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting surveys.
 - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled

meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

- a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Certified Surveys: Submit **10** copies signed by land surveyor.
- C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least **10 days** prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching. Show how they will be performed and indicate why they cannot be avoided.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
 6. Structural Elements: Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 7. Designer's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit **10** copies showing the Work performed and record survey data.

1.7 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Designer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - a. Where possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.

- 1) Processed concrete finishes.
- 2) Ornamental metal.
- 3) Matched-veneer woodwork.
- 4) Preformed metal panels.
- 5) Roofing.
- 6) Firestopping.
- 7) Window wall system.
- 8) Fluid-applied flooring.
- 9) HVAC enclosures, cabinets, or covers.

- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
- D. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Cutting and Patching: Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
 3. Photograph existing conditions prior to cutting.
- C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Designer and Owner not less than 2 days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Designer promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Designer when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Designer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Designer before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by a North Carolina Licensed Land Surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Final Acceptance, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb, and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of **96 inches (2440 mm)** in occupied spaces and **90 inches (2300 mm)** in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Designer. Maintain conditions required for product performance until Final Acceptance.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction forces.
1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
 2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Final Acceptance.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Final Acceptance.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Final Acceptance.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- D. Restore permanent facilities used during construction to their specified condition.
- E. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- F. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- G. Remove and replace chipped, scratched, and broken glass or reflective surfaces.
- H. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- I. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT 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 includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manuals.
 - 4. Warranties.
 - 5. Instruction of Owner's personnel.
 - 6. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Final Acceptance and Final Completion.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
 - 3. Division 1 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.
 - 4. Article 25 of the General Conditions.
 - 5. Divisions 2 through 32 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting inspection for determining date of Final Acceptance, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives damage or settlement surveys, property surveys, and similar final record information.
 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. Complete startup testing of systems.
 9. Submit test/adjust/balance records.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Final Acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Final Acceptance after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION, PROJECT ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion and project acceptance, complete the following:
1. Submit a final Application for Payment 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 certified copy of Designer's Final Acceptance inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Designer.
 4. Submit final meter readings for utilities, a measured record for stored fuel, and similar data as of the date of Final Acceptance or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
 5. Submit Consent of Surety to Final Payment.
 6. Submit a final liquidated damages settlement statement.
 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 8. Submit pest-control final inspection report and warranty.
 9. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Designer will either proceed with inspection or notify Contractor of unfulfilled requirements. Designer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Re-inspection Procedure: The Designer will inspect the work upon notice that the Work, including inspection list items from previous inspections, has been completed, except for those items whose completion is delayed under circumstances acceptable to the Designer.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit 3 copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Designer.
 - d. Name of Contractor.
 - e. Page number.

1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Designer's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark 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.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
 1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.

h. Copies of warranties and bonds.

- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Final Acceptance is indicated.
- B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Provide instructors experienced in operation and maintenance procedures.
 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 3. Schedule training with Owner, through designer with at least 7 days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
 1. System design and operational philosophy.
 2. Review of documentation.
 3. Operations.
 4. Adjustments.
 5. Troubleshooting.
 6. Maintenance.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Final Acceptance for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

- m. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For videographer.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit three copies within ten business days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017700 "Closeout Procedures."

1.5 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- C. Pre-Instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.

- l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

1.9 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least ten business days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.
 1. Submit video recordings on thumb drive.
 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. Email address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 1. Furnish additional portable lighting as required.

- E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION 017900

SECTION 022210 - HYDRANT FLOW TEST

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section contains subsurface information that has been obtained with reasonable care and is recorded in good faith. Bidders must use their own judgment interpreting the information provided.
- B. The bidder, at his own expense, may perform additional subsurface exploration to obtain additional information. This work may only be performed upon written approval by the Owner.
- C. The owner, nor designer assumes no responsibility for the accuracy of such information included in the Hydrant Flow Test.

1.3 HYDRANT FLOW TEST

- A. The published "Hydrant Flow Test Duplin District G Airport Rd ~1940' From Int with Bowdens Rd January 26, 2024" was performed by McDavid Associates, Inc., 3714 N. Main Street, Farmville, North Carolina 27828, and is dated January 26, 2024.
- B. The hydrant flow test is bound herein as a part of this section on the following pages. The report is titled: Hydrant Flow Test Duplin District G Airport Rd ~1940' From Int with Bowdens Rd. The test report is 1 page.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 022210

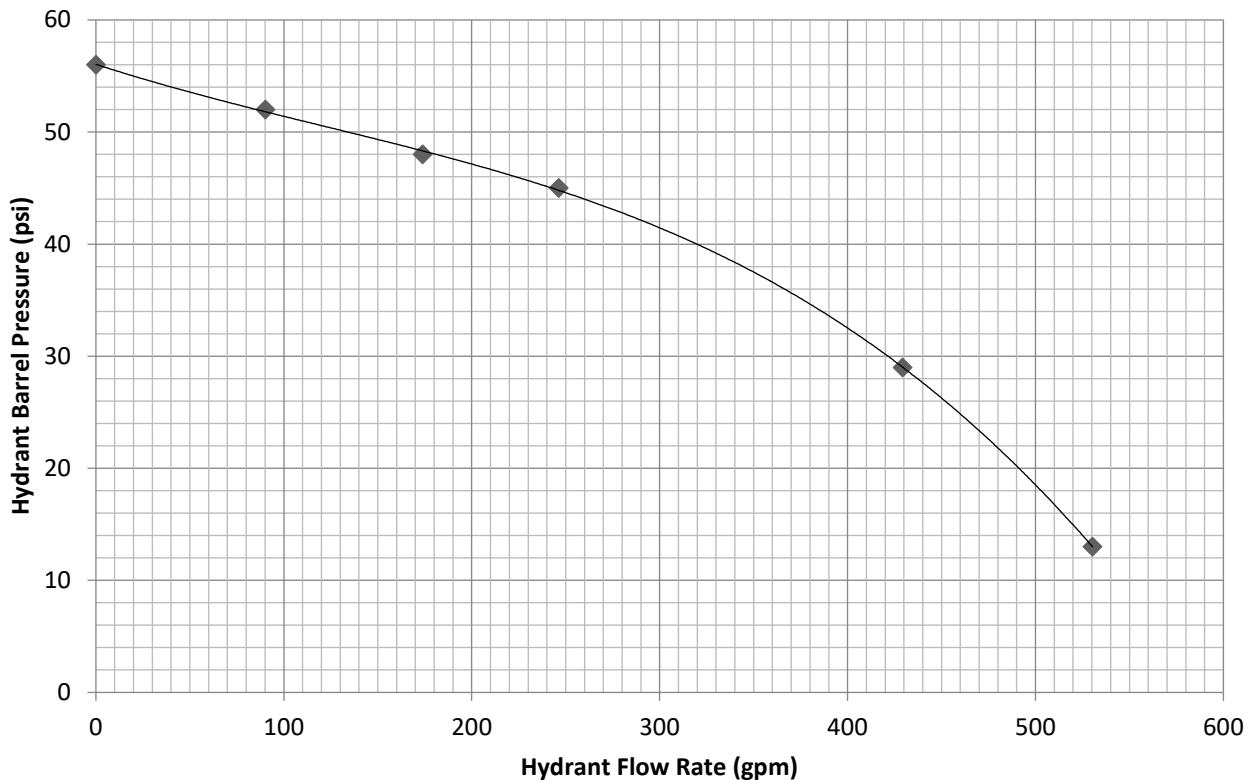
Hydrant Flow Test
 Duplin County Water District G
 Airport Rd ~ 1940 ft from int with Bowdens Rd
 4.5" Kennedy on 8" PVC Line
 EST F1 @ 33.3' out of 37.0' full
 January 26, 2024 9:00 AM

455,770 Northing
 2,302,999 Easting
 143.47 elev hydrant outlet

EST E1 @ 33.0' out of 37.0' full
 Well G2 off, BPS F1 off, BPS D-1 off, Well E-2 off, BPS F2 on

Cv of Orifice	Diameter of Orifice (inches)	Residual Pressure Hydrant Barrel (psi)	Projected Flow (gpm)
0	0	56	0
12.5	1	52	90
25.1	1.25	48	174
36.7	1.5	45	246
79.7	2	29	429
147.1	2.5	13	530
390	4.5		

Hydrant Flow Test Duplin District G Airport Rd ~1940' from Int with Bowdens Rd January 26, 2024



SECTION 023000 - SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section contains subsurface information that has been obtained with reasonable care and is recorded in good faith. Bidders must use their own judgment interpreting the information provided.
- B. The bidder, at his own expense, may perform additional subsurface exploration to obtain additional information. This work may only be performed upon written approval by the Owner.
- C. The owner, nor designer assumes no responsibility for the accuracy of such information included in the Subsurface Report.

1.3 SUBSURFACE REPORT

- A. The published "Geotechnical Engineering Report - NC Forest Service Headquarters Airport Road, Kenansville, North Carolina" was performed by Timmons Group, 5410 Trinity Road, Suite 102, Raleigh, North Carolina 27607, and is dated March 29, 2024. Timmons Group Job No # 45231.
- B. The subsurface report is bound herein as a part of this section on the following pages. The report is titled: Geotechnical Engineering Report - NC Forest Service Headquarters Airport Road, Kenansville, North Carolina. The report is 51 pages.

1.4 SUBSURFACE REPORT ADDENDUM

- A. The published "Addendum to Geotechnical Engineering Report - Driven Pile Recommendation for Tank Support- NC Forest Service Headquarters Airport Road, Kenansville, North Carolina" was performed by Timmons Group, 5410 Trinity Road, Suite 102, Raleigh, North Carolina 27607, and is dated May 13, 2025. Timmons Group Job No # 45231.
- B. The subsurface report addendum is bound herein as a part of this section on the following pages. The report addendum is titled: Addendum to Geotechnical Engineering Report - Driven Pile Recommendation for Tank Support- NC Forest Service Headquarters Airport Road, Kenansville, North Carolina. The report addendum is 3 pages.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 023000

GEOTECHNICAL ENGINEERING REPORT

**NC FOREST SERVICE HEADQUARTERS
AIRPORT ROAD
KENANSVILLE, NORTH CAROLINA**

JOB NUMBER: 45231

PREPARED FOR:

**WILLIARD STEWART ARCHITECTS
122 COX AVENUE
RALEIGH, NORTH CAROLINA 27605**

March 29, 2024



TIMMONS GROUP

YOUR VISION ACHIEVED THROUGH OURS.

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APPENDICES

Appendix A – Figures

Appendix B – Boring Logs

Appendix C – Laboratory Results

EXECUTIVE SUMMARY

For your convenience, this report is summarized in outline form below. This brief summary should not be used for design or construction purposes without reviewing the more detailed conclusions and recommendations contained in this report.

1. The subsurface exploration included a visual site reconnaissance, performance of 14 soil test borings to depths ranging from approximately 10 to 70 feet below the ground surface.
2. The borings encountered approximately 8 to 11 inches of superficial topsoil. Below topsoil, “undisturbed” soils were encountered to boring termination depths of up to approximately 70 feet. The typical soil profile consisted of very loose to dense sands (SP, SW, SC, SC-SM) with varying amounts of fines or very soft to very hard clays (CL) with varying amounts of sand. Water was encountered in the borings just below ground surface but is likely elevated due to introduction of drilling fluid. Groundwater is expected to be within 5 to 10 feet of the ground surface.
3. We recommend that site grading be conducted during the typically warmer summer months.
4. Relatively loose/soft near-surface soils were encountered in the borings. Based on the borings, we expect that at least 12 inches of undercut will be required in the building areas to adequately prepare soil subgrades to receive structural fill. The actual amount of repairs required will likely depend on prevailing weather conditions, frequency of construction traffic operating on exposed subgrades, and other factors.
5. We expect most of the fill used to raise site grades will be imported, and we recommend the imported fill materials consist of sands or well-graded gravels.
6. The proposed buildings may be supported on shallow foundations bearing in approved, undisturbed soils or new structural fill.
7. The tank may be supported on a mat foundation or reinforced concrete slab bearing in approved near-surface soils provided a total foundation settlement of 2 to 3 inches can be tolerated. If this settlement is not tolerable, the tank will require support on a driven pile supported foundation.
8. Recommended pavement sections are provided in this report.
9. Based on exploration of the site, we recommend the site be considered Seismic Site Classification E per the North Carolina Building Code.



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March 29, 2024

Williard Stewart Architects
122 Cox Avenue
Raleigh, North Carolina 27605

Attention: Mr. Paul Stewart

Re: **Geotechnical Engineering Report**
NC Forest Service Headquarters
Airport Road
Kenansville, North Carolina
Timmons Group Project No. 45231

Mr. Stewart:

Timmons Group is pleased to submit this geotechnical engineering report for the referenced project. The objectives of our services were to explore subsurface conditions and provide our geotechnical recommendations for site grading and foundation support.

1. PROJECT INFORMATION

The site is currently undeveloped woodlands, located off Airport Road in Kenansville, North Carolina. A Site Vicinity Map is shown in Figure 1.

The site is bounded by undeveloped woodlands to the north, the Duplin County Airport to the east, Bowdens Road to the west, and Airport Road to the south. Ground surface elevations across the area of exploration range from approximately 135 feet along the southwest side of the site to 147 feet along the northeast side of the site. Site grades generally slope downward from the northeast to southwest.

Proposed construction will consist of a single-story administrative building, a single-story maintenance building, and a 200,000-gallon, steel ground-supported water storage tank, and associated pavements. We understand the proposed building final floor elevations will be between 142 and 143 feet. We expect the tank area will have a similar final grade elevation. Maximum fill depths are expected to be approximately 5 feet to reach finished grade. Additionally, expect that

maximum column and wall loads for the buildings will be 50 kips and 3 kips per linear foot, respectively. If anticipated building loads are higher than those stated in this report, or if grades differ from those assumed, we must be contacted to review and potentially revise our foundation recommendations.

2. FIELD EXPLORATION

The field exploration included a visual site reconnaissance by a representative of Timmons Group and performance of fourteen soil test borings (B-01 through B-14). Boring locations were selected by Timmons Group. A representative from Timmons Group established boring locations in the field using GPS Equipment. Approximate boring locations are shown on Figure 2 in the Appendix.

Borings were performed to depths ranging from approximately 10 to 70 feet below the existing ground surface with hollow stem auger drilling techniques. Split-spoon samples of subsurface soils were taken within soil test borings at approximate 2.5-foot depth intervals above a depth of 10 feet and at 5-foot intervals below 10 feet. Standard Penetration Tests were conducted in conjunction with split-spoon sampling in general accordance with ASTM D 1586.

Water levels were measured in open boreholes at the time of drilling. Upon completion, boreholes were then backfilled up to the original ground surface with drill cuttings. Representative portions of split-spoon soil samples and bulk soil samples were returned to our laboratory for quantitative testing and visual classification in general accordance with Unified Soil Classification System guidelines.

Boring logs and generalized soil profiles (Figures 3A and 3B), which present specific information from the borings, are included in the Appendix. Stratification lines shown on the boring logs and profile are intended to represent approximate depths of changes in soil types. Naturally, transitional changes in soil types are often gradual and cannot be defined at particular depths. Boring elevations shown on the logs and profile were interpolated from the project topographic plan and should be considered approximate.

3. SITE GEOLOGY

According to the 1985 Geologic Map of North Carolina, the project site is located in the Coastal Plain Physiographic Province. The coastal plain characterized by marine to fluvial sediments, varying from clay to gravel, poorly to well sorted, with lateral variation in thickness, although generally increasing in thickness towards the east. Vertical variation within the geologic formations of the coastal plain is often controlled by cyclic sequences that fine or coarsen with depth, with formations separated by unconformities. Regionally, the stratigraphy of the coastal plain can be generalized as a wedge of sediments composed of fluvial and coastal plain sands and

gravels of Quaternary and upper Tertiary age, underlain by marine, deltaic, and fluvial clays, silts, and sands of lower Tertiary age, underlain by fluvial-deltaic to shallow-shelf sands and clays of Cretaceous age, underlain by crystalline bedrock. Depth to bedrock varies from tens of feet near the western extent of the coastal plain to over 3,000 feet near the Atlantic coastline.

According to the Map, the site is underlain by the Black Creek Formation. The Black Creek Formation is described as Clay, gray to black, lignitic; contains thin beds and laminae of fine-grained micaceous sand and thick lenses of cross-bedded sand. Glauconitic, fossiliferous clayey sand lenses in upper part.

4. LABORATORY TESTING

Laboratory testing was performed on representative split-spoon soil samples and a bulk soil sample collected from the borings. This testing consisted of natural moisture content, Atterberg limits, grain size analyses, Standard Proctor, and California Bearing Ratio (CBR). Laboratory tests were performed in general accordance with applicable ASTM procedures. Individual laboratory test data sheets are provided in the Appendix. A summary of laboratory test data is provided in the tables below.

Natural Moisture and Classification Tests

Boring	Depth (Feet)	Natural Moisture Content (%)	Atterberg Limits			Grain Size Analysis		USCS Classification
			LL	PL	PI	% Sand And Gravel	% Fines*	
B-01	1-2.5	22.9	25	16	9	69.8	30.2	SC
B-01	13.5-15	25.8	26	13	13	72.4	27.6	SC
B-02	8.5-10	29.3	NP	NP	NP	95.8	4.2	SP
B-02	18.5-20	34.0	NP	NP	NP	95.4	4.6	SW
B-03	1-5	12.2	NP	NP	NP	88.1	11.9	SC
B-07	1-2.5	19.6	23	20	4	70.8	29.2	SC-SM
B-07	6-7.5	20.0	32	21	11	74.8	25.2	SC
B-11	1-5	10.8	NP	NP	NP	76.6	23.4	SC

*Material passing No. 200 sieve (clay and silt)

Standard Proctor and CBR Testing

Boring	Depth (Feet)	Natural Moisture Content (%)	Standard Proctor		CBR (0.1")	%Swell	USCS Classification
			Optimum Moisture Content (%)	Maximum Dry Density (pcf)			
B-03	1-5	12.2	13.5	112.4	23.8	0.1	SC
B-11	1-5	10.8	12.9	112.3	16.9	0.0	SC

Based on the Atterberg limits testing, near-surface soils are of low plasticity. Based on comparison of natural moisture contents of near surface soils to the optimum moisture content of the bulk sample, near-surface soils appear near to wet of optimum moisture. The time of year and prevailing weather conditions at the time grading occurs will likely have a significant impact on the moisture levels of near-surface soils and the amount of moisture manipulation required prior to re-using on-site soils as structural fill.

5. SUBSURFACE CONDITIONS

5.1 Ground Surface Cover

The borings encountered approximately 8 to 11 inches of superficial topsoil.

5.2 Undisturbed Soils

Below ground surface cover, “undisturbed” soils were encountered to depths up to approximately 70 feet. The typical soil profile consisted of very loose to dense sands (SP, SW, SC, SC-SM) with varying amounts of fines or very soft to very hard clays (CL) with varying amounts of sand. Standard Penetration Test (SPT) N-values in the undisturbed soils ranged from 0 to 50+ blows per foot, with typical values of 2 to 18 blows per foot.

An approximate 10-foot-thick, soft clay layer was encountered at depths ranging from approximately 20 to 30 feet below the ground surface.

5.3 Borehole Water Levels

At the time of drilling, water was encountered in the borings just below ground surface. However, the measured borehole water levels were likely influenced by the introduction of drilling fluid and are likely higher than actual groundwater depths. We expect that groundwater is likely present within 5 to 10 feet of the existing ground surface. It is important to realize that groundwater levels will fluctuate with changes in rainfall and evaporation rates. In addition, perched groundwater could be encountered within near-surface soils, particularly after rainfall.

6. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based upon our borings, engineering analysis, and past experience with similar projects and subsurface conditions. If structural loads are higher than assumed, or future site grades differ from, those assumed, we must be contacted to confirm or revise the recommendations of this report.

6.1 Site Preparation

6.1.1 General

Site grading will be difficult during periods of extended rainfall and low temperatures that generally occur during the late fall to early spring months. Near-surface soils are moisture sensitive, particularly the clays. If grading is conducted during a wet time period, soils at this site will be susceptible to rutting and pumping under rubber-tired traffic and provide poor subgrade support for floor slabs and pavements. Heavy rubber-tired construction equipment should not be allowed to operate on wet or unstable subgrades at this site due to the potential for rutting and other damage to the soils. To reduce potential earthwork problems, site preparation and grading should be scheduled during the typically drier summer months, if possible. We recommend that exposed subgrades be sloped and sealed at the end of each day to promote runoff and reduce infiltration from rainfall.

Site preparation should begin with clearing and grubbing of trees, stripping of topsoil, and removal of any other unsuitable materials. Any existing water supply wells should be abandoned in accordance with the North Carolina Department of Environment and Natural Resources (NCDENR) requirements. Approximately 8 to 11 inches of superficial topsoil was encountered in the borings. However, stripping activities often mix topsoil with underlying “clean” soils and cause topsoil stripping depths to be greater than actual topsoil depths, particularly during wet periods of the year. Topsoil should be wasted from the site or permanently stockpiled outside the proposed construction limits. Vegetation should be wasted from the site.

6.1.2 Subgrade Evaluation

After stripping, soil subgrades in areas to receive fill and those at finished subgrade should be evaluated by the Geotechnical Engineer or his representative. To aid the engineer during this evaluation, exposed soil subgrades should be proofrolled with a loaded tandem axle dump truck or equivalent. Proofrolling will help to reveal the presence of unstable or otherwise unsuitable surface materials. The following methods are typically used to repair soil subgrades that are observed to rut, pump, or deflect excessively during proofrolling:

- Undercut the unstable soils to firm soils and replace them with suitable, well compacted fill.
- In-place repair of near-surface soils by scarifying, drying and recompacting, when weather conditions are favorable.

6.1.3 Undercut Potential

Relatively loose/soft soils were encountered in the borings. In favorable weather conditions, it is possible that these soft/loose soils can be repaired in place, as summarized above, where they are

relative thin. During wet weather conditions, undercutting and replacement of soft/loose near-surface soils may be required. Where soft/loose soils extend deeper, it may be possible to use a combination of shallow undercut and geotextile stabilization fabrics (to reduce the amount of undercutting) outside building areas. Based on the borings, we expect that at least 12 inches of undercut will be required in the building areas to adequately prepare soil subgrades to receive structural fill. The amount of repairs required will likely depend on prevailing weather conditions, frequency of construction traffic operating on exposed subgrades, and other factors.

The site is relatively flat and may tend to pond water on soil subgrades during precipitation events. If site drainage is not properly maintained, soil subgrades will likely become wet and unstable under construction traffic, thereby requiring repairs. Construction of temporary ditches may be needed to properly control surface runoff.

6.2 Excavations

Borings typically encountered low to moderate consistency soils, which can likely be excavated by routine earth-moving equipment. Soil types with respect to trench safety must be evaluated on a case-by-case basis. The Contractor should be responsible for all site safety, including the determination of appropriate trench safety measures according to OSHA guidelines. Groundwater at this site is expected to be present within 5 to 10 feet of the existing ground surface.

6.3 Structural Fill

We expect most of the materials used as structural fill will be imported. Imported materials used as structural fill should consist of sands or gravels that are free of debris, contain less than 5 percent organics, have a maximum liquid limit (LL) of 30, and a maximum plasticity index (PI) of 15. Acceptable imported soil types are USCS classifications SM, SC, SP, and GM. The maximum particle size of imported fill materials should not exceed 2 inches.

The low-plasticity soils encountered in the borings may be re-used as structural fill for this project, provided the soil moisture can be properly controlled. On-site soils used as structural fill should have a maximum LL of 45, a maximum PI of 25, and otherwise meet the requirements above. The moisture content of near-surface soils was measured to be near to wet of optimum moisture. The need for moisture manipulation (i.e., drying or wetting) will likely depend on prevailing weather conditions at the time of construction.

Structural fill should be placed in maximum 8 to 10-inch loose lifts and compacted to at least 95 percent of the Standard Proctor maximum dry density (ASTM D 698). Within 12 inches relative to finished soil subgrade, structural fill should be compacted to at least 98 percent of the Standard Proctor maximum dry density. Structural fill should be maintained within 3 percent points of optimum moisture during placement and compaction.

Site preparation, including fill placement and compaction, should be observed by a qualified soils technician working under the direction of the Geotechnical Engineer. During fill placement, a sufficient amount of in-place density tests should be conducted to confirm that compaction and fill moisture is in accordance with our recommendations.

6.4 Potential Subgrade Repair and Improvement Methods

Exposed subgrade soils can deteriorate and lose support when exposed to construction activity and environmental changes. This is particularly true for the clayey soils encountered at this site. Subgrade soil deterioration can occur in the form of freezing, erosion, softening from ponded rainwater, and rutting from construction traffic. Deterioration may be reduced by limiting heavy rubber-tired traffic over exposed soils and maintaining proper surface drainage within cut and fill areas. We recommend that any exposed subgrade surfaces in pavement and structural areas that have softened and deteriorated be properly repaired by scarifying and recompacting immediately prior to construction. If repairs are performed in wet weather conditions, it will be worthwhile to consider undercutting the disturbed soil and replacing it with compacted crushed stone.

6.5 Building Foundations

Based on anticipated structural loads, performed borings, and our analysis, the proposed buildings may be supported on shallow foundations bearing in approved undisturbed soils or new structural fill overlying approved undisturbed soils. Existing fill, if encountered beneath foundations, is not acceptable for shallow foundation support. Shallow foundations may be designed using an allowable bearing pressure of 2,000 pounds per square foot (psf).

Individual column foundations and continuous wall foundations should be at least 24 inches and 18 inches wide, respectively. This recommendation is made to prevent a localized or “punching” shear failure condition which can occur with very narrow foundations. Shallow foundations should be embedded at least 18 inches below finished exterior grade for frost protection.

Foundation excavations should be evaluated by the Geotechnical Engineer or his representative prior to reinforcing steel and concrete placement. The evaluation should involve probing of foundation bearing surfaces, advancing shallow hand auger borings, and dynamic cone penetrometer (DCP) testing. If soft soils or existing fill are encountered at the foundation bearing level, they should be overexcavated and replaced with NCDOT No. 57 stone. We recommend the No. 57 stone be placed in maximum 24-inch lifts, with each lift thoroughly tamped with an excavator bucket to “seat” the stone.

If groundwater or surface water runoff collects in any excavation, it should be removed promptly. Care should be exercised during construction of foundations in order not to disturb bearing soils and reduce their bearing strength. Concrete for the foundations should be placed as soon as

practical following excavation. If concrete placement is delayed, placement of a concrete “mud mat” on exposed bearing soils should be considered.

6.6 Tank Foundation

The proposed tank, located in the vicinity of Borings B-13 and B-14, may be supported on a mat foundation or structural concrete slab with an applied bearing pressure of 2,000 psf or less, provided a total foundation settlement of approximately 2 to 3 inches can be tolerated, as discussed in the follow section. We anticipate that a perimeter ring wall foundation will be constructed around the tank foundation for erosion and frost protection. We recommend the ringwall foundation bear at least 18 inches below finished exterior grade for frost protection. We recommend placing an 18-to-24-inch thick layer of compacted NCDOT crushed aggregate base course (CABC) beneath the mat/slab to provide more uniform support. We recommend the CABC be compacted to at least 98 percent of its Standard Proctor maximum dry density (ASTM D698) and placed in accordance with the Structural Fill recommendations of this report.

Foundation excavations should be evaluated by the Geotechnical Engineer or his representative prior to reinforcing steel and concrete placement. The evaluation should involve probing of foundation bearing surfaces, advancing shallow hand auger borings, and dynamic cone penetrometer (DCP) testing. Where excessively loose/soft soils exist at bearing elevations, neatline overexcavation and replacement of foundation bearing soils with NCDOT No. 57 or compacted CABC will be required.

6.7 Foundation Settlement

6.7.1 Building Foundations

Based on anticipated structural loads and our analysis, we expect that total foundation settlement for the building’s foundations will be one inch or less. Our settlement estimate is based on an applied bearing pressure of 2,000 psf, assumes foundations bear on approved materials, and assumes that any existing fill is removed from beneath foundations. Differential settlements should be less should be less than ½ inches for footings bearing on similar materials.

6.7.2 Tank Foundation

Based on the anticipated applied tank bottom pressure of 2,000 psf, we estimate total settlement beneath the tank center will be 2 to 3 inches. Differential settlements are expected to be approximately 1 inch or less between the tank center and edges, assuming similar foundation bearing materials over the tank area. Based on our past experience with similar tanks, we assume these magnitudes of settlement are tolerable. These settlement estimates assume the tank area is prepared in accordance with the recommendations of this. If the settlement estimates are not

tolerable, the tank will require support on a deep foundation system consisting of driven piles. If needed, Timmons Group can provide recommendations for a driven pile system that can be used to support the tank.

6.8 Slabs-On-Grade

It is our opinion that a modulus of subgrade reaction of 125 pci is applicable for slab-on-grade design for the buildings, provided that subgrades are prepared in accordance with the recommendations of this report. This design modulus is applicable for point loads or light distributed loads (100 psf or less). We recommend that building foundations be separated from the slabs-on-grade to allow for relative movement.

In addition, we recommend that a minimum of 6 inches of NCDOT CABC stone or No. 57 stone be considered for placement beneath concrete slabs to provide greater uniformity in slab subgrade support. We recommend that the stone be compacted to at least 98 percent of its Standard Proctor maximum dry density (ASTM D 698). A vapor barrier should be installed beneath the slab in accordance with ACI 302.1 (Guide to Concrete Floor and Slab Construction).

Exposure to the environment and construction activities will weaken the floor slab subgrade soils. Therefore, we recommend that subgrade soils in slab areas be evaluated prior to crushed stone placement. If deterioration of soils has occurred, undercutting may be necessary.

6.9 Seismic Site Classification

Based on our test borings and our past experience, it is our opinion the site should be considered Seismic Site Classification E in accordance with the current North Carolina Building Code.

6.10 Pavements

Details regarding proposed vehicular traffic types and their frequencies were unknown at the time of this report. Based on our past experience with similar soils and our laboratory tests, a design California Bearing Ratio (CBR) value of 8 percent should be available for pavement design assuming the in-place subgrade soil is compacted to at least 98 percent of its Standard Proctor maximum dry density (ASTM D698).

The table below presents typical sections for heavy-duty drives and light-duty parking stalls. The heavy-duty section should be adequate to support occasional trucks (dual-axle box trucks, occasional tractor trailers, and municipal waste trucks) and channelized light-duty traffic. The light-duty section in the table below should be adequate for light-duty (car) parking stalls.

Asphalt Pavement Sections

Heavy-Duty Section	Light-Duty Parking Stalls
2 Inches NCDOT S9.5B	2 Inches NCDOT S9.5B
3 Inches NCDOT I19.0C	----
8 Inches NCDOT ABC Stone	8 Inches NCDOT ABC Stone

Our experience indicates that an overlay of asphalt pavements may be needed in approximately 10 to 12 years due to normal weathering (oxidation). Also, some areas could require repair in a shorter time period.

All materials and construction methods should conform to the latest edition of the NCDOT Standard Specifications for Roads and Structures. To confirm that the base course stone has been uniformly compacted and meets NCDOT density requirements, in-place density tests should be performed by a qualified soils technician and the area should be thoroughly proofrolled under his observation.

Important factors regarding pavement performance are the condition of subgrade soils at time of construction and post construction drainage. We recommend that all pavement subgrade areas be evaluated prior to base course stone placement. Any areas which deflect or rut during proofrolling must be repaired prior to stone placement. Sufficient testing and observation should be performed during pavement construction to confirm that the required thickness, density, and quality requirements of the specifications are followed.

7. LIMITATIONS OF REPORT

The recommendations contained in this report are made on the basis of the site information made available to us and the surface and subsurface conditions that existed at the time of the exploration. While this exploration has been conducted in accordance with generally accepted geotechnical engineering practices, there remains some potential for variation of the subsurface conditions in unexplored areas of the site. If the subsurface conditions encountered during construction vary significantly from those presented in this report, we should be notified to reevaluate our recommendations. No other warranty, expressed or implied, is made as to the professional advice included in this report.

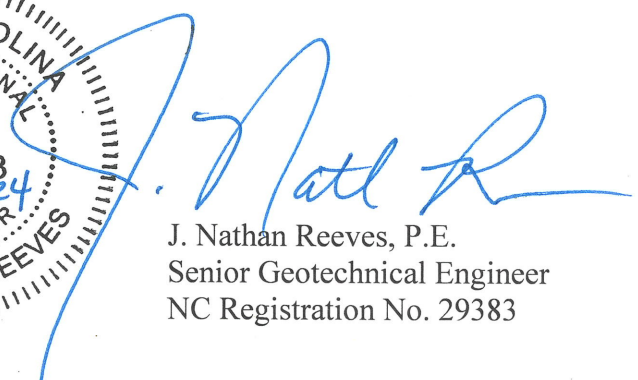
8. CLOSURE

We appreciate this opportunity to be of service to you on this project. If you have any questions regarding this report or if we can be of further assistance, please contact us at (919) 866-4951.

Respectfully submitted,
TIMMONS GROUP



Jesse L. Israel, E.I.
Geotechnical Project Manager



J. Nathan Reeves, P.E.
Senior Geotechnical Engineer
NC Registration No. 29383

APPENDIX A

FIGURES



SCALE: NTS	 TIMMONS GROUP <small>YOUR VISION ACHIEVED THROUGH OURS.</small>	SITE VICINITY MAP NORTH CAROLINA FOREST SEVICE HEADQUARTERS AIRPORT ROAD KENANSVILLE, NORTH CAROLINA	DRAWING 1
CHECKED BY: JNR			
PLOTTED BY: JLI			
DATE: 2/29/2024			
PROJECT NUMBER: 45231			



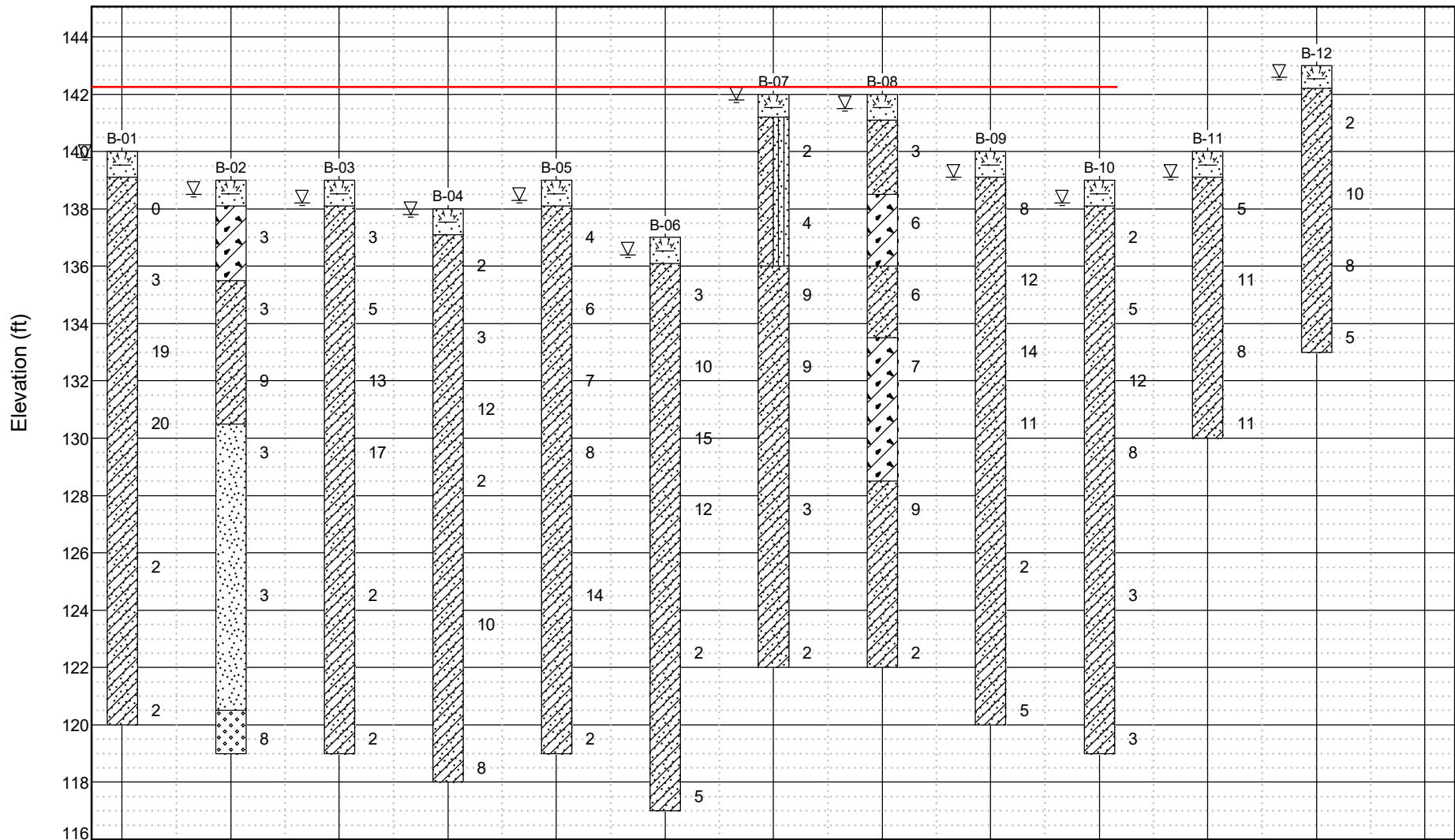
Scale: Not to scale
Date: 2/29/2024
Drawn By: JLI
Project No.: 45231



Boring Location Plan

North Carolina Forest Service Headquarters
Kenansville, North Carolina

Figure No.
2



Lithology Symbols

- Topsoil
- Low Plasticity Clay
- Well-graded Sand
- Clayey Sand
- Poorly-graded Sand
- Clayey Sand

Groundwater Symbols

- At End of Drilling
- At 24 Hours

Exploration Symbols

- B-01 (Exploration ID)
- 13 (N-Value)
- 53% 98%(RQD REC)

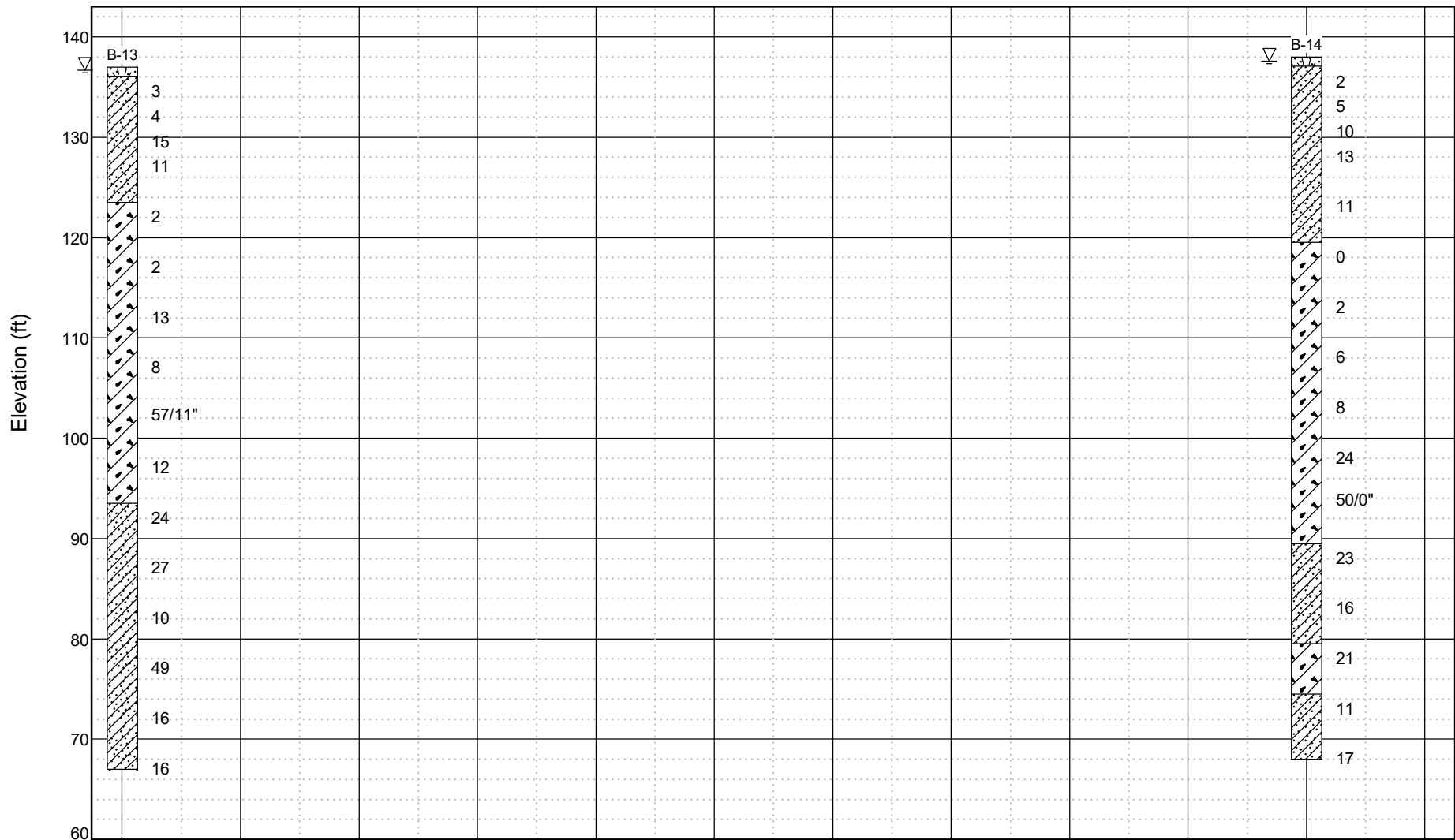


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Soil Profile

NC Forest Service HQ
Kenansville, NC

PROJECT NUMBER		DRAWN BY	DATE DRAWN
45231		JLI	3/21/24
HORIZONTAL SCALE		APPROVED BY	FIGURE
VERTICAL SCALE		JNR	3A



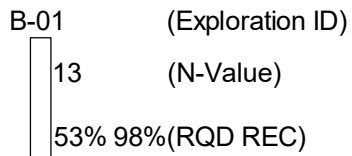
Lithology Symbols



Groundwater Symbols



Exploration Symbols



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Soil Profile

NC Forest Service HQ
Kenansville, NC

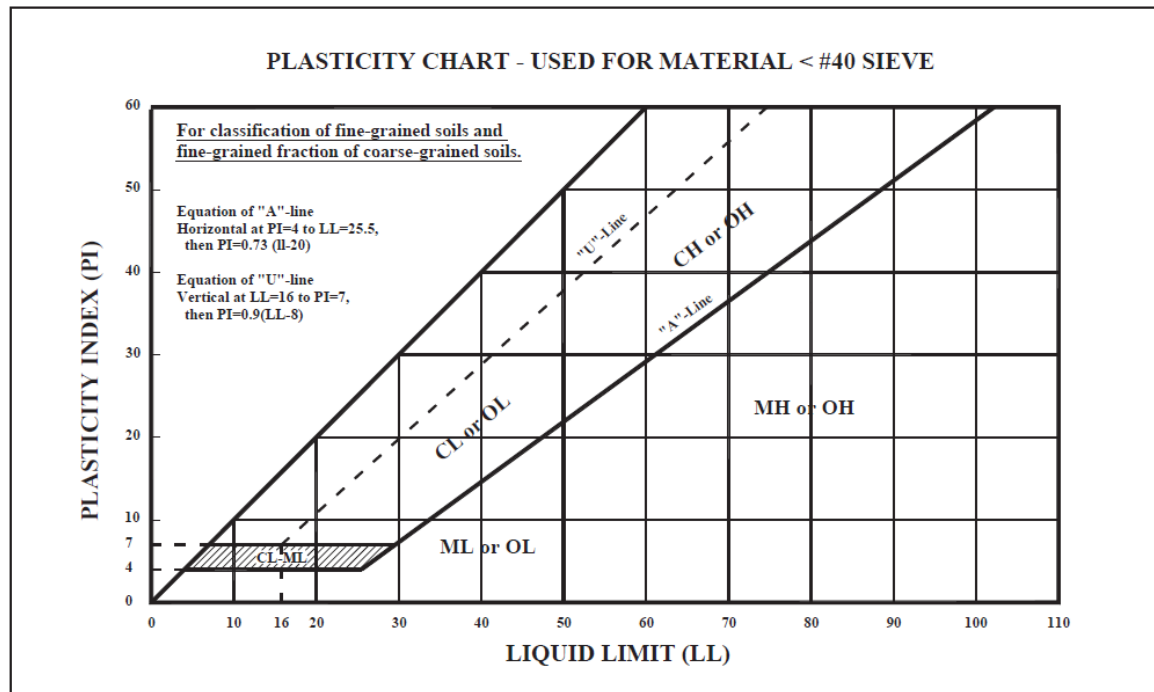
PROJECT NUMBER	DRAWN BY	DATE DRAWN
45231	JLI	3/21/24
HORIZONTAL SCALE	APPROVED BY	FIGURE
VERTICAL SCALE	JNR	3B

APPENDIX B
BORING LOGS




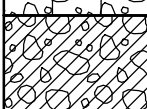
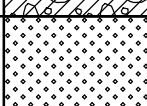
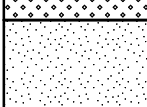
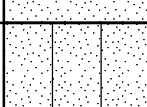
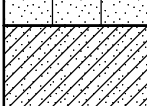
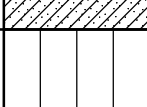
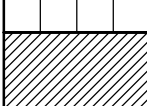
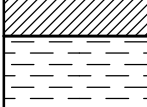
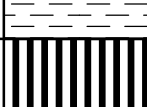

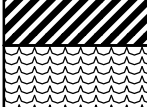
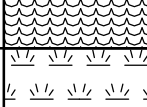
KEY TO BORING LOG TERMINOLOGY

Relative Density – Used for soils with less than 50% passing No. 200 sieve		Consistency – Used for soils with 50 percent or more passing No. 200 sieve	
Relative Density	SPT N-Value (blows/ft)	Consistency	SPT N-Value (blows/foot)
Very Loose	0 to 3	Very Soft	0 to 2
Loose	4 to 10	Soft	3 to 4
Medium Dense	11 to 30	Firm	4 to 8
Dense	31 to 49	Stiff	9 to 15
Very Dense	Greater than 50	Very Stiff	15 to 30
		Hard	31 to 49
		Very Hard	Greater than 50

Grain Size Terminology (U.S. Standard Sieves)		Natural Moisture Content	
Term	Particle Size		
Boulder	12 inches +	Dry	Very little apparent moisture, dusty
Cobble	3 to 12 inches		
Coarse Gravel	¾ to 3 inches	Moist	Damp, but no free water visible
Fine Gravel	#4 to ¾ inches		
Coarse Sand	#10 to #4		
Medium Sand	#40 to #10	Wet	Visible free water, or in cohesive soil, clearly saturated
Fine Sand	#200 to #40		
Silt and Clay	<#200		



SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/31/2024	COMPLETED 1/31/2024	GROUND ELEVATION 140 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.20 ft / Elev 139.80 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

TG GEOTECH BH LOG V2.0 - GINT STD US LAB.GDT - 3/21/24 13:35 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\NC FOREST SERVICE HQ.GPJ

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0	140	▽ TOPSOIL - 9"					
		CLAYEY SAND: (SC): grayish tan to dark brownish gray, fine to medium grained, very loose to medium dense		1, SPT 0-0-0 (0)			
5	135			2, SPT 1-1-2 (3)			
				3, SPT 7-9-10 (19)			
10	130			4, SPT 8-10-10 (20)			
				5, SPT 1-1-1 (2)			
15	125						
				6, SPT 1-1-1 (2)			
20	120						

Bottom of borehole at 20.0 feet.



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BORING B-02

PAGE 1 OF 1

PROJECT NUMBER	45231	PROJECT NAME	NC Forest Service Headquarters
CLIENT	Williard Stewart Architects	PROJECT LOCATION	Kenansville, NC
DATE STARTED	1/31/2024	COMPLETED	1/31/2024
GROUND ELEVATION	139 ft	HOLE DEPTH	20 feet
DRILLING CONTRACTOR	Bridger Drilling	BOREHOLE WATER LEVELS:	
DRILLING METHOD	Mud Rotary	▽ AT END OF DRILLING	0.50 ft / Elev 138.50 ft
LOGGED BY	J. Israel, E.I.	CHECKED BY	N. Reeves, P.E.
▽ AT 24 HOURS DRILLING	---		
NOTES	CAVE DEPTH		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 10"					
		SANDY CLAY: (CL): tan, fine grained, soft		1, SPT 1-2-1 (3)			
5	135	CLAYEY SAND: (SC): gray to light gray, fine to medium grained, very loose to loose		2, SPT 1-2-1 (3)			
				3, SPT 4-5-4 (9)			
10	130	SAND: (SP): dark grayish black to dark grayish brown, fine to coarse grained, very loose		4, SPT 1-2-1 (3)			
15	125	W/ SHELL FRAGMENTS		5, SPT 1-1-2 (3)			
20	120	SAND: (SW): dark grayish brown, fine to coarse grained, loose		6, SPT 2-3-5 (8)			
Bottom of borehole at 20.0 feet.							



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/31/2024	COMPLETED 1/31/2024	GROUND ELEVATION 139 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.80 ft / Elev 138.20 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 10"					
		CLAYEY SAND: (SC): dark gray to light gray, fine to medium grained, very loose to medium dense		1, SPT 1-2-1 (3)			
5	135			2, SPT 2-3-2 (5)			
				3, SPT 5-7-6 (13)			
10	130			4, SPT 5-7-10 (17)			
				5, SPT 1-1-1 (2)			
15	125						
				6, SPT 1-1-1 (2)			
20	120						
Bottom of borehole at 20.0 feet.							



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/31/2024	COMPLETED 1/31/2024	GROUND ELEVATION 138 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.20 ft / Elev 137.80 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽					
		TOPSOIL - 10"					
	135	CLAYEY SAND: (SC): grayish tan to dark blueish gray, fine to coarse grained, very loose to medium dense		1, SPT 1-1-1 (2)			
5				2, SPT 1-1-2 (3)			
	130			3, SPT 6-3-9 (12)			
10				4, SPT 1-1-1 (2)			
	125	W/ SHELL FRAGMENTS		5, SPT 2-4-6 (10)			
15							
	120			6, SPT 2-3-5 (8)			
20							

Bottom of borehole at 20.0 feet.



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DATE STARTED 1/31/2024	COMPLETED 1/31/2024	GROUND ELEVATION 137 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.60 ft / Elev 136.40 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▽ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0							
		▽ TOPSOIL - 10"					
	135	CLAYEY SAND: (SC): brownish gray to dark blueish gray, fine to coarse grained, very loose to medium dense		1, SPT 1-2-1 (3)			
5				2, SPT 4-5-5 (10)			
	130			3, SPT 7-7-8 (15)			
10				4, SPT 5-5-7 (12)			
	125						
15				5, SPT 1-1-1 (2)			
	120						
20		W/ SHELL FRAGMENTS		6, SPT 2-2-3 (5)			
Bottom of borehole at 20.0 feet.							



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/30/2024	COMPLETED 1/30/2024	GROUND ELEVATION 142 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.20 ft / Elev 141.80 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽					
		TOPSOIL - 8"					
	140	CLAYEY SAND: (SC-SM): light brownish tan to light tannish gray, fine to medium grained, very loose to loose		1, SPT 1-1-1 (2)			
5				2, SPT 2-2-2 (4)			
	135	CLAYEY SAND: (SC): light tannish brown to dark gray, fine to medium grained, very loose to loose		3, SPT 3-4-5 (9)			
10				4, SPT 3-4-5 (9)			
	130						
15				5, SPT 3-2-1 (3)			
	125						
20				6, SPT 1-1-1 (2)			

Bottom of borehole at 20.0 feet.

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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/30/2024	COMPLETED 1/30/2024	GROUND ELEVATION 142 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.50 ft / Elev 141.50 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
NOTES		▽ AT 24 HOURS DRILLING ---	
		CAVE DEPTH	

TG GEOTECH BH LOG V2.0 - GINT STD US LAB.GDT - 3/21/24 13:35 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\NC FOREST SERVICE HQ.GPJ

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 9"					
	140	CLAYEY SAND: (SC): light brownish tan, fine to medium grained, very loose		1, SPT 1-1-2 (3)			
5		SANDY CLAY: (CL): grayish tan, fine to medium grained, firm		2, SPT 2-3-3 (6)			
	135	CLAYEY SAND: (SC): gray, fine to medium grained, loose		3, SPT 2-3-3 (6)			
10		SANDY CLAY: (CL): light whiteish gray, fine grained, firm		4, SPT 2-3-4 (7)			
	130						
15		CLAYEY SAND: (SC): tan to dark gray, fine to medium grained, very loose to loose		5, SPT 5-5-4 (9)			
	125						
20				6, SPT 1-1-1 (2)			

Bottom of borehole at 20.0 feet.



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/30/2024	COMPLETED 1/30/2024	GROUND ELEVATION 140 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.90 ft / Elev 139.10 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

TG GEOTECH BH LOG V2.0 - GINT STD US LAB.GDT - 3/21/24 13:35 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\NC FOREST SERVICE HQ.GPJ

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0	140						
		▽ TOPSOIL - 9"					
		CLAYEY SAND: (SC): tannish gray to dark grayish black, fine to medium grained, very loose to medium dense		1, SPT 2-3-5 (8)			
5	135			2, SPT 4-5-7 (12)			
				3, SPT 5-7-7 (14)			
10	130			4, SPT 4-5-6 (11)			
				5, SPT 1-1-1 (2)			
15	125						
		W/ SHELL FRAGMENTS		6, SPT 2-2-3 (5)			
20	120						

Bottom of borehole at 20.0 feet.



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/30/2024	COMPLETED 1/30/2024	GROUND ELEVATION 139 ft	HOLE DEPTH 20 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.80 ft / Elev 138.20 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

TG GEOTECH BH LOG V2.0 - GINT STD US LAB.GDT - 3/21/24 13:35 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\NC FOREST SERVICE HQ.GPJ

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 10"					
		CLAYEY SAND: (SC): dark grayish black to light tannish gray, fine to medium grained, very loose to medium dense		1, SPT 1-1-1 (2)			
5	135			2, SPT 2-3-2 (5)			
				3, SPT 4-5-7 (12)			
10	130			4, SPT 3-4-4 (8)			
				5, SPT 2-2-1 (3)			
15	125						
				6, SPT 1-1-2 (3)			
20	120						

Bottom of borehole at 20.0 feet.



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/31/2024	COMPLETED 1/31/2024	GROUND ELEVATION 140 ft	HOLE DEPTH 10 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.90 ft / Elev 139.10 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0	140						
		▽ TOPSOIL - 9"					
		CLAYEY SAND: (SC): gray to light gray, fine to medium grained, loose to medium dense		1, SPT 2-3-2 (5)			
5	135			2, SPT 5-6-5 (11)			
				3, SPT 3-4-4 (8)			
10	130			4, SPT 4-5-6 (11)			

Bottom of borehole at 10.0 feet.



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PROJECT NUMBER <u>45231</u>		PROJECT NAME <u>NC Forest Service Headquarters</u>	
CLIENT <u>Williard Stewart Architects</u>		PROJECT LOCATION <u>Kenansville, NC</u>	
DATE STARTED <u>1/31/2024</u>	COMPLETED <u>1/31/2024</u>	GROUND ELEVATION <u>143 ft</u>	HOLE DEPTH <u>10 feet</u>
DRILLING CONTRACTOR <u>Bridger Drilling</u>		BOREHOLE WATER LEVELS:	
DRILLING METHOD <u>Mud Rotary</u>		▽ AT END OF DRILLING <u>0.40 ft / Elev 142.60 ft</u>	
LOGGED BY <u>J. Israel, E.I.</u>		CHECKED BY <u>N. Reeves, P.E.</u>	
NOTES _____		▽ AT 24 HOURS DRILLING <u>---</u>	
		CAVE DEPTH _____	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 8"					
	140	CLAYEY SAND: (SC): tan to gray, fine to medium grained, very loose to medium dense		1, SPT 1-1-1 (2)			
5				2, SPT 4-5-5 (10)			
	135			3, SPT 3-4-4 (8)			
10				4, SPT 2-2-3 (5)			

Bottom of borehole at 10.0 feet.

PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/29/2024	COMPLETED 1/29/2024	GROUND ELEVATION 137 ft	HOLE DEPTH 70 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.30 ft / Elev 136.70 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
NOTES		▽ AT 24 HOURS DRILLING ---	
		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 11"					
	135	CLAYEY SAND: (SC): tannish gray to light whiteish gray, fine to medium grained, very loose to medium dense		1, SPT 1-2-1 (3)			
5				2, SPT 1-1-3 (4)			
	130			3, SPT 5-7-8 (15)			
10				4, SPT 5-6-5 (11)			
	125						
15		SANDY CLAY: (CL): dark grayish black to dark blueish gray, fine to coarse grained, soft to very hard		5, SPT 1-1-1 (2)			
	120						
20				6, SPT 1-1-1 (2)			
	115						
25		W/ SHELL FRAGMENTS		7, SPT 7-6-7 (13)			
	110						
30				8, SPT 2-3-5 (8)			
	105						
35				9, SPT 57/11"			
	100						
40				10, SPT 4-5-7			

(Continued Next Page)

Bottom of borehole at 70.0 feet.



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PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/30/2024	COMPLETED 1/30/2024	GROUND ELEVATION 138 ft	HOLE DEPTH 70 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.40 ft / Elev 137.60 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
0		▽ TOPSOIL - 10"					
	135	CLAYEY SAND: (SC): tannish gray to light whiteish gray, fine to medium grained, very loose to medium dense		1, SPT 1-1-1 (2)			
5				2, SPT 1-2-3 (5)			
	130			3, SPT 5-5-5 (10)			
10				4, SPT 7-6-7 (13)			
	125						
15				5, SPT 5-4-7 (11)			
	120						
20		SANDY CLAY: (CL): dark grayish black to dark gray, fine to medium grained, very soft to very hard		6, SPT 0-0-0 (0)			
	115						
25				7, SPT 1-1-1 (2)			
	110						
30				8, SPT 2-2-4 (6)			
	105						
35				9, SPT 3-3-5 (8)			
	100						
40				10, SPT 13-10-14			

(Continued Next Page)



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Telephone: 919-866-4951

PROJECT NUMBER 45231		PROJECT NAME NC Forest Service Headquarters	
CLIENT Williard Stewart Architects		PROJECT LOCATION Kenansville, NC	
DATE STARTED 1/30/2024	COMPLETED 1/30/2024	GROUND ELEVATION 138 ft	HOLE DEPTH 70 feet
DRILLING CONTRACTOR Bridger Drilling		BOREHOLE WATER LEVELS:	
DRILLING METHOD Mud Rotary		▽ AT END OF DRILLING 0.40 ft / Elev 137.60 ft	
LOGGED BY J. Israel, E.I.		CHECKED BY N. Reeves, P.E.	
		▼ AT 24 HOURS DRILLING ---	
NOTES		CAVE DEPTH	

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SYMBOL	SAMPLING BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	LAB TESTS	REMARKS
40				(24)			
95		SANDY CLAY: (CL): dark grayish black to dark gray, fine to medium grained, very soft to very hard (continued)		11, SPT 50/0"			
45							
90							
50		CLAYEY SAND: (SC): dark grayish black, fine to medium grained, medium dense		12, SPT 7-10-13 (23)			
85							
55				13, SPT 6-8-8 (16)			
80							
60		SANDY CLAY: (CL): dark grayish black, fine grained, very stiff		14, SPT 8-9-12 (21)			
75							
65		CLAYEY SAND: (SC): dark grayish black, fine to medium grained, medium dense		15, SPT 5-4-7 (11)			
70							
70				16, SPT 6-9-8 (17)			

Bottom of borehole at 70.0 feet.

TG GEOTECH BH LOG V2.0 - GINT STD US LAB.GDT - 3/21/24 13:35 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\NC FOREST SERVICE HQ.GPJ

APPENDIX C

LABORATORY TEST RESULTS

Material Classification
ASTM D2487

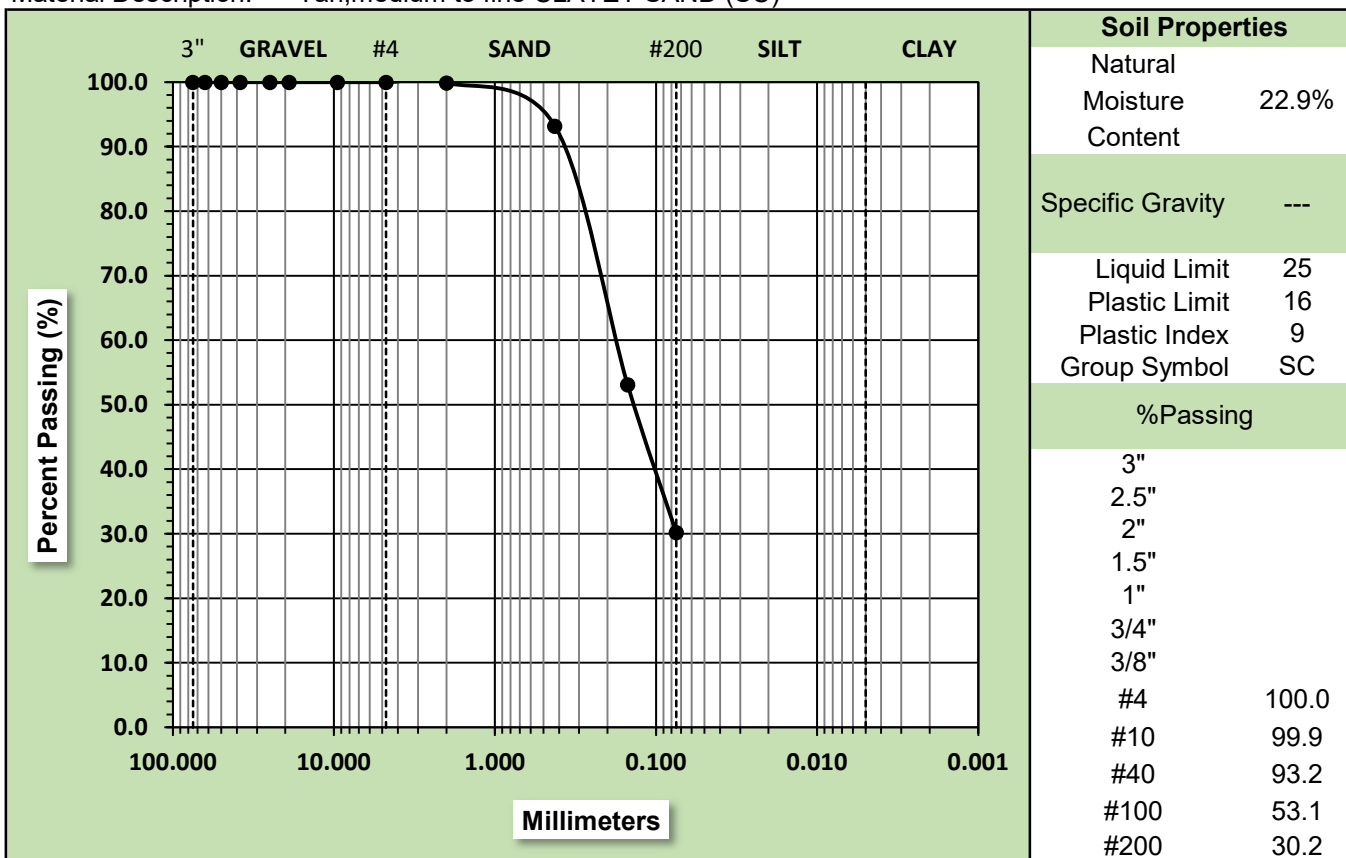


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-1 Sample #: S-1 Sample Date: 3/8/2024
Depth: 1 to 2.5 feet Offset: N/A Lab Control #: 3
Material Description: Tan, medium to fine CLAYEY SAND (SC)



Maximum Particle Size #4 Gravel 0.0% Sand 69.8% Silt and Clay 30.2%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS
ASTM D4318 Method A tested on 3/8-3/15/24 by CAS

Chris Smith		Laboratory Manager	3/20/24
Technical Responsibility	Signature	Position	Date

Information included in this report relates only to material sampled at the time of testing.

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Material Classification
ASTM D2487

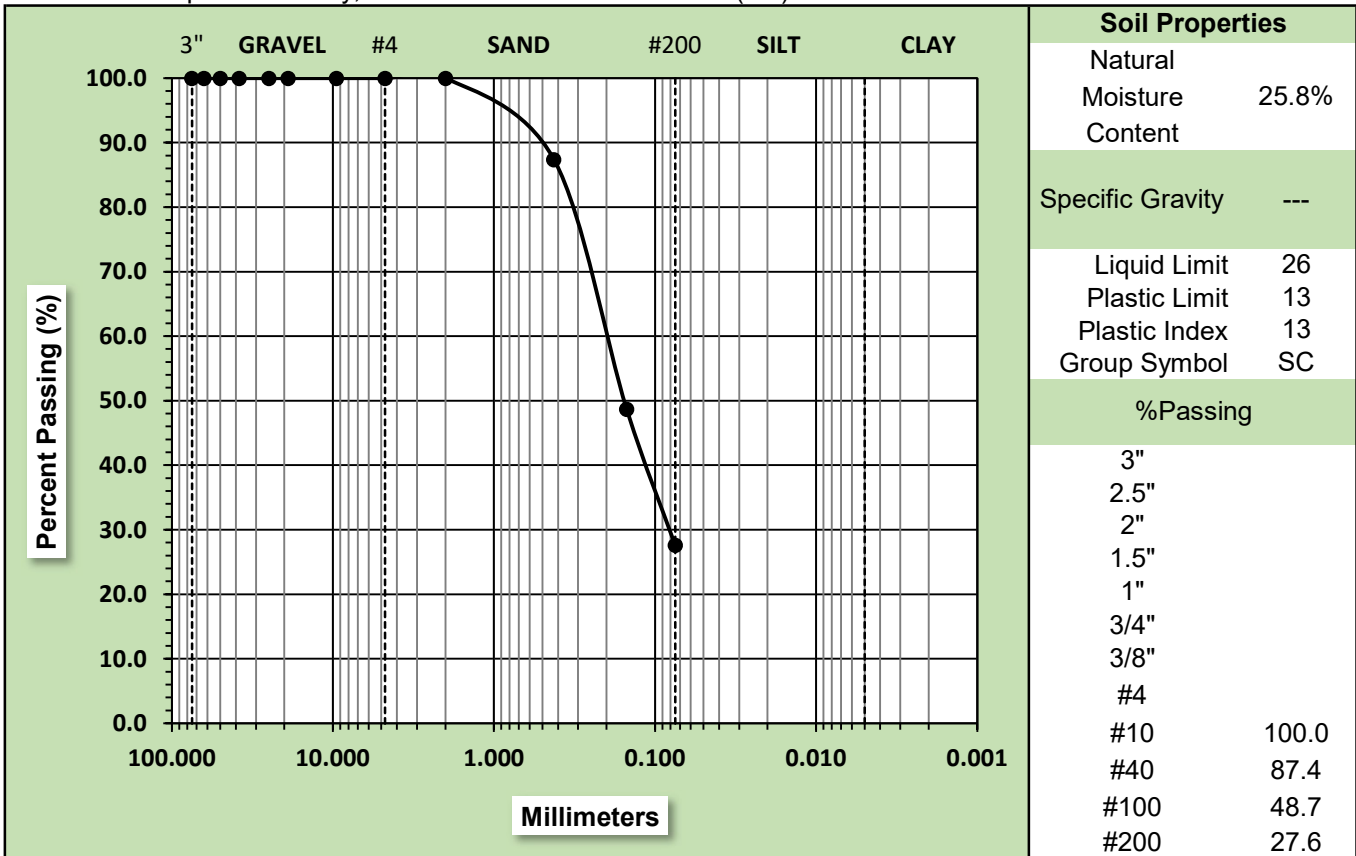


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-1 Sample #: S-5 Sample Date: 3/8/2024
Depth: 13.5 to 15 feet Offset: N/A Lab Control #: 4
Material Description: Gray, medium to fine CLAYEY SAND (SC)



Maximum Particle Size #10 Gravel 0.0% Sand 72.4% Silt and Clay 27.6%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS
ASTM D4318 Method A tested on 3/8-3/15/24 by CAS

Chris Smith Laboratory Manager 3/20/24
Technical Responsibility Signature Position Date

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Material Classification
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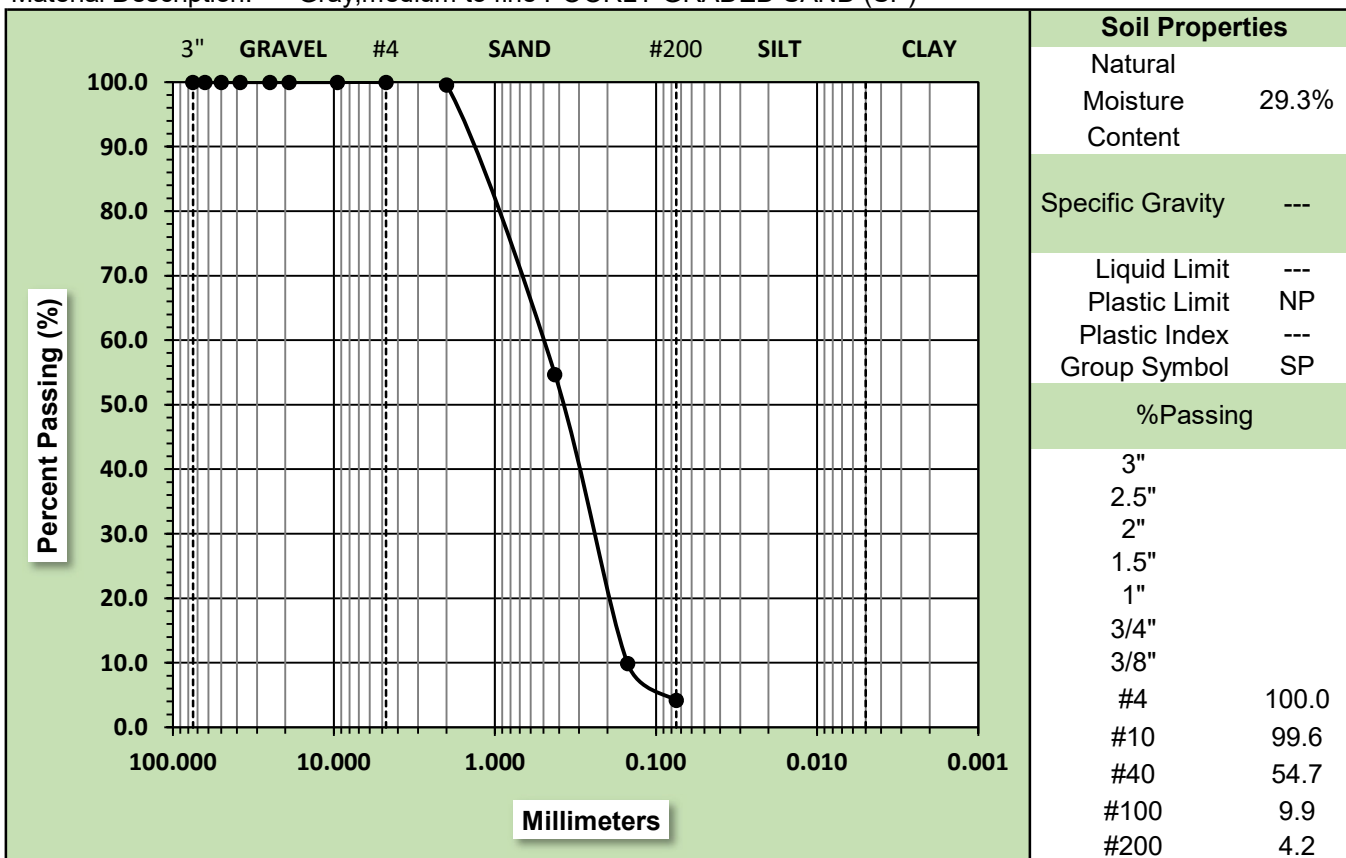


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-2 Sample #: S-4 Sample Date: 3/8/2024
Depth: 8.5 to 10 feet Offset: N/A Lab Control #: 5
Material Description: Gray, medium to fine POORLY GRADED SAND (SP)



Maximum Particle Size #4 Gravel 0.0% Sand 95.8% Silt and Clay 4.2%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS

Chris Smith Laboratory Manager 3/20/24
Technical Responsibility Signature Position Date

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Material Classification
ASTM D2487

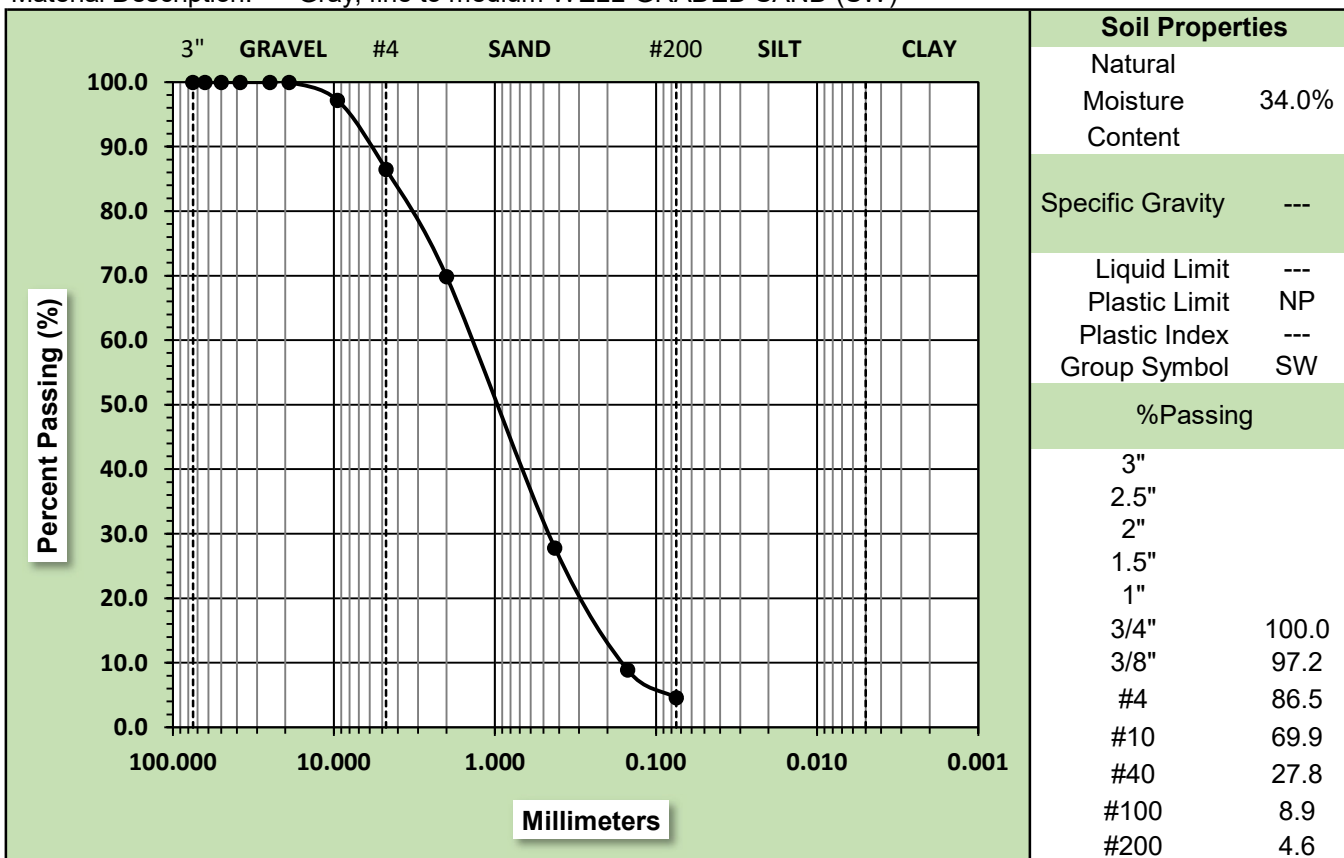


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-2 Sample #: S-6 Sample Date: 3/8/2024
Depth: 18.5 to 20 feet Offset: N/A Lab Control #: 6
Material Description: Gray, fine to medium WELL-GRADED SAND (SW)



Maximum Particle Size 3/4" Gravel 13.5% Sand 81.9% Silt and Clay 4.6%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS

Chris Smith Laboratory Manager 3/20/24
Technical Responsibility Signature Position Date

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Material Classification
ASTM D2487

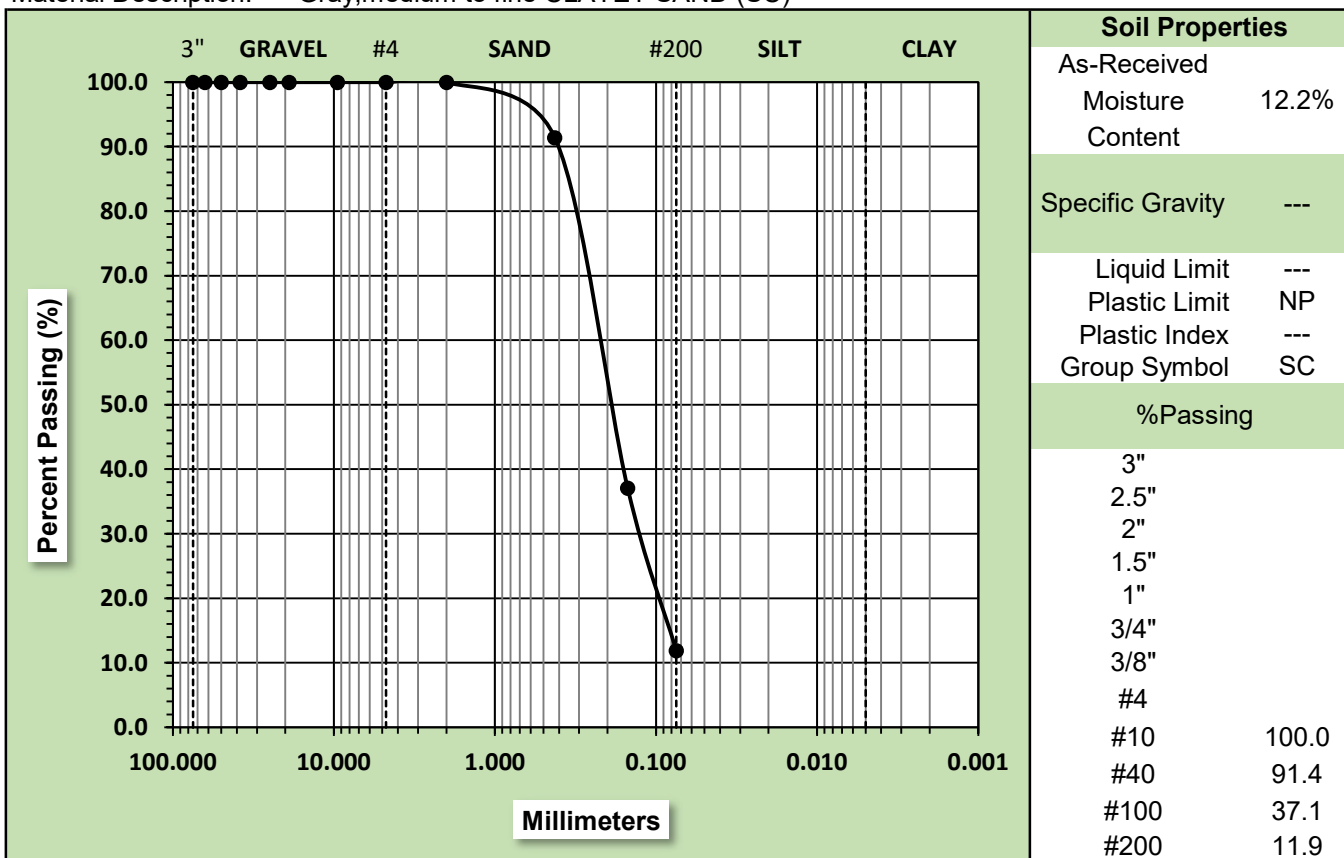


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-3 Sample #: Bulk Sample Date: 3/8/2024
Depth: 1 to 5 feet Offset: N/A Lab Control #: 1
Material Description: Gray, medium to fine CLAYEY SAND (SC)



Maximum Particle Size #10 Gravel 0.0% Sand 88.1% Silt and Clay 11.9%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS

Chris Smith		Laboratory Manager	3/20/24
Technical Responsibility	Signature	Position	Date

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Material Classification
ASTM D2487

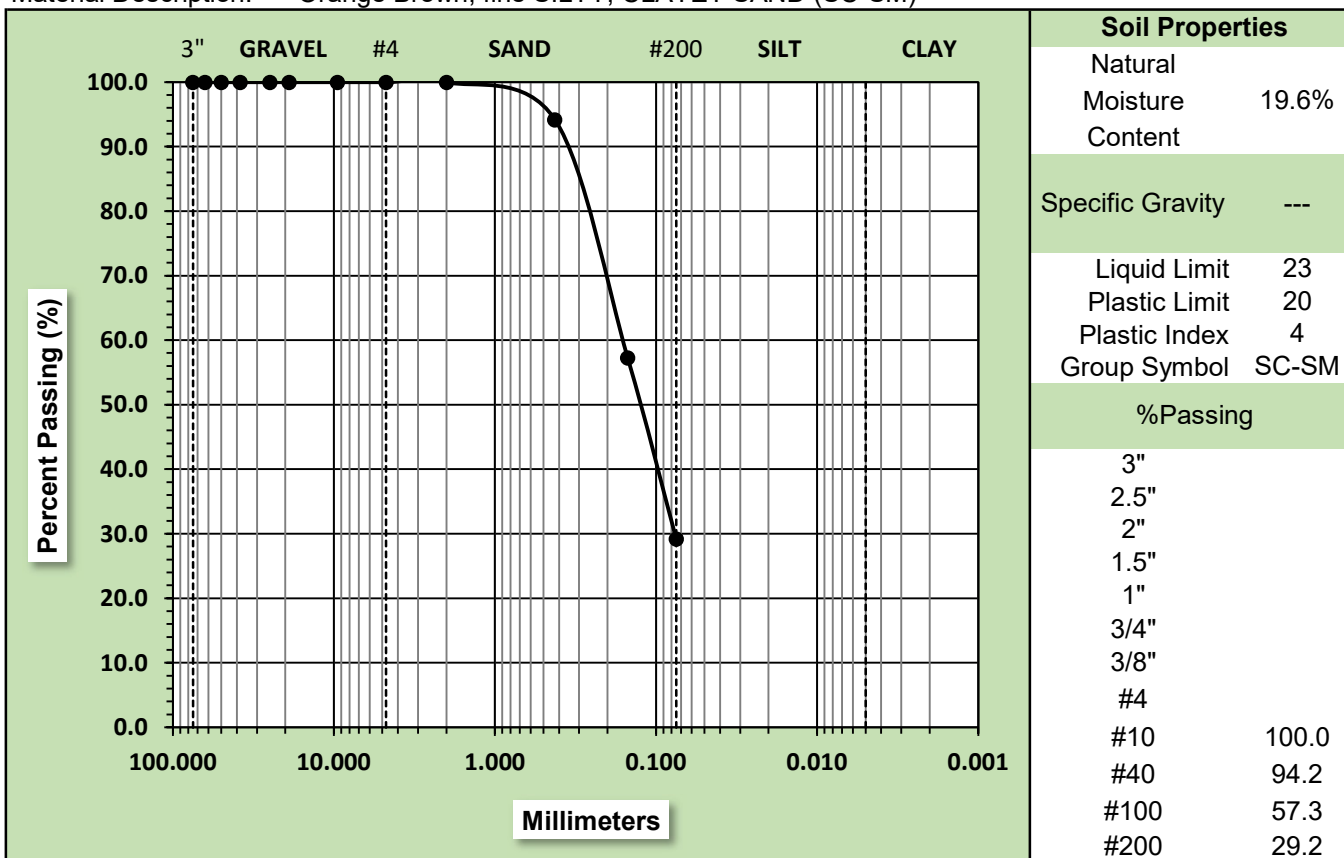


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-7 Sample #: S-1 Sample Date: 3/8/2024
Depth: 1 to 2.5 feet Offset: N/A Lab Control #: 7
Material Description: Orange Brown, fine SILTY, CLAYEY SAND (SC-SM)



Maximum Particle Size #10 Gravel 0.0% Sand 70.8% Silt and Clay 29.2%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS
ASTM D4318 Method A tested on 3/8-3/15/24 by CAS

Chris Smith		Laboratory Manager	3/20/24
Technical Responsibility	Signature	Position	Date

Information included in this report relates only to material sampled at the time of testing.

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Material Classification

ASTM D2487

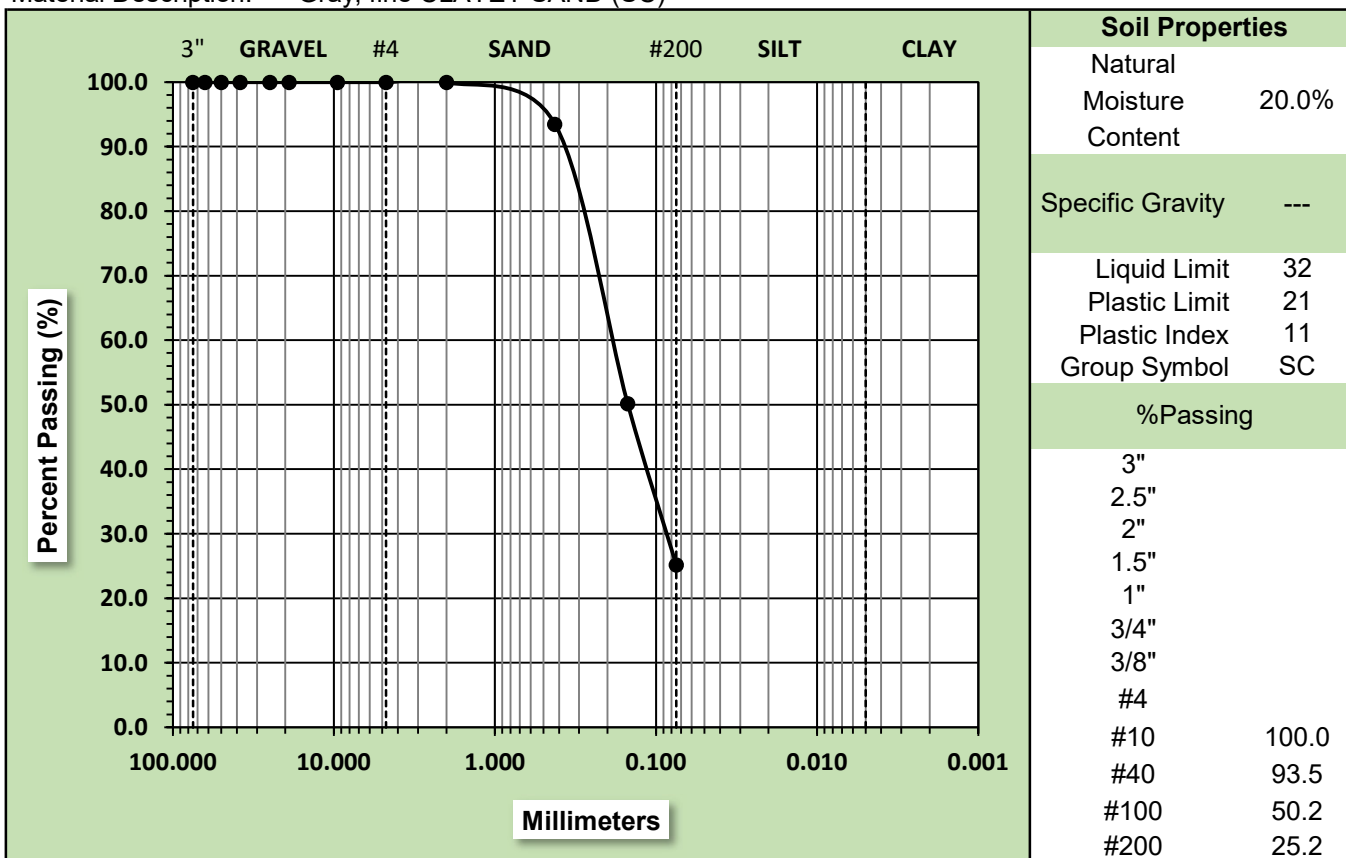


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-7 Sample #: S-3 Sample Date: 3/8/2024
Depth: 6 to 7.5 feet Offset: N/A Lab Control #: 8
Material Description: Gray, fine CLAYEY SAND (SC)



Maximum Particle Size #10 Gravel 0.0% Sand 74.8% Silt and Clay 25.2%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS
ASTM D4318 Method A tested on 3/8-3/15/24 by CAS

Chris Smith		Laboratory Manager	3/20/24
Technical Responsibility	Signature	Position	Date

Information included in this report relates only to material sampled at the time of testing.

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Material Classification
ASTM D2487

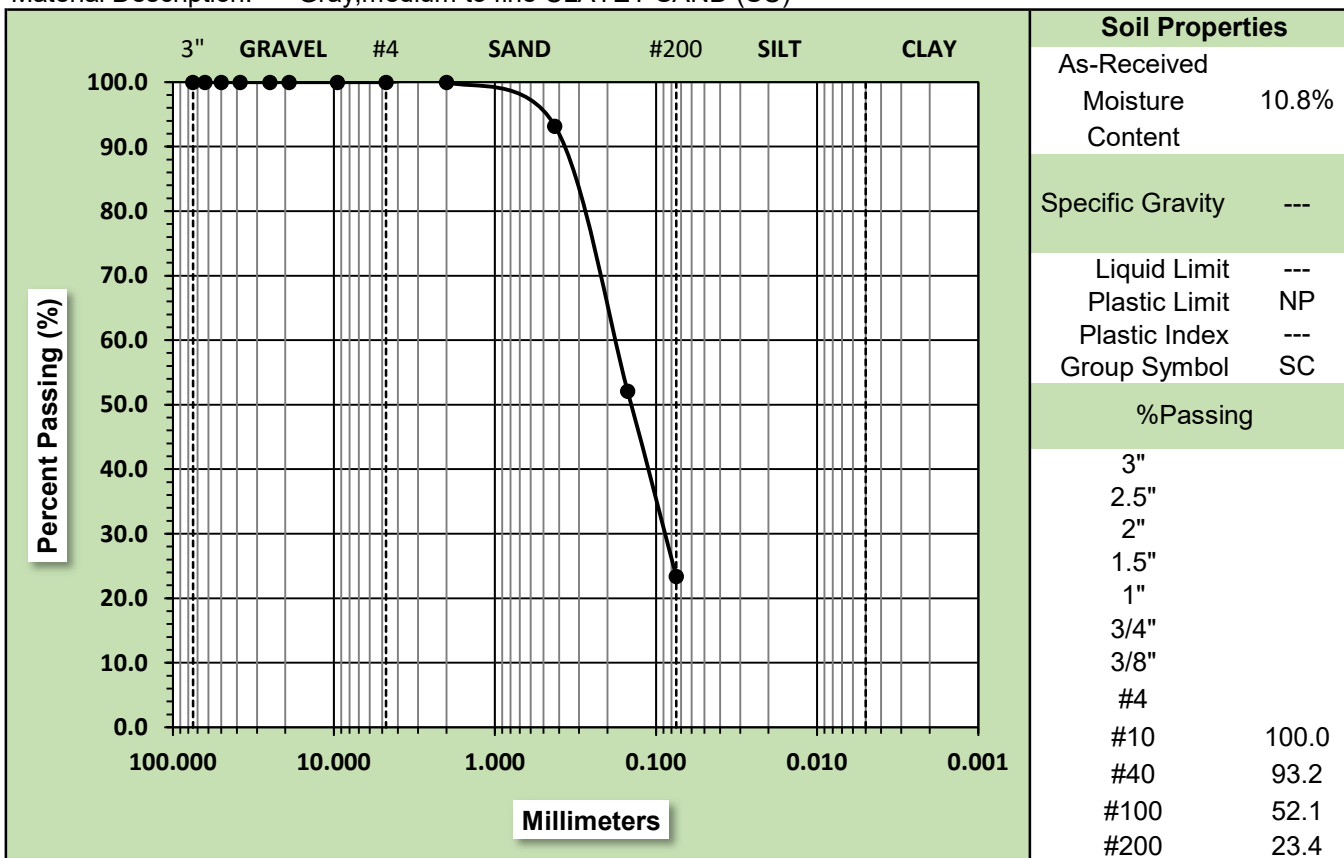


PROJECT INFORMATION

Project #: 45231 Report Date: 3/20/2024
Project Name: NC Forest Service Headquarters
Project Location: Duplin Co., NC
Client Name: Williard Stewart Architects

SAMPLE INFORMATION

Location: B-11 Sample #: Bulk Sample Date: 3/8/2024
Depth: 1 to 5 feet Offset: N/A Lab Control #: 2
Material Description: Gray, medium to fine CLAYEY SAND (SC)



Maximum Particle Size #10 Gravel 0.0% Sand 76.6% Silt and Clay 23.4%

C_u --- C_c ---

Description of Sand & Gravel Particles: Rounded, Angular, Hard

Notes:

References: ASTM D2216 Method A tested on 3/8-3/12/24 by CAS
ASTM D422 tested on 3/8-3/12/24 by CAS

Chris Smith		Laboratory Manager	3/20/24
Technical Responsibility	Signature	Position	Date

Information included in this report relates only to material sampled at the time of testing.

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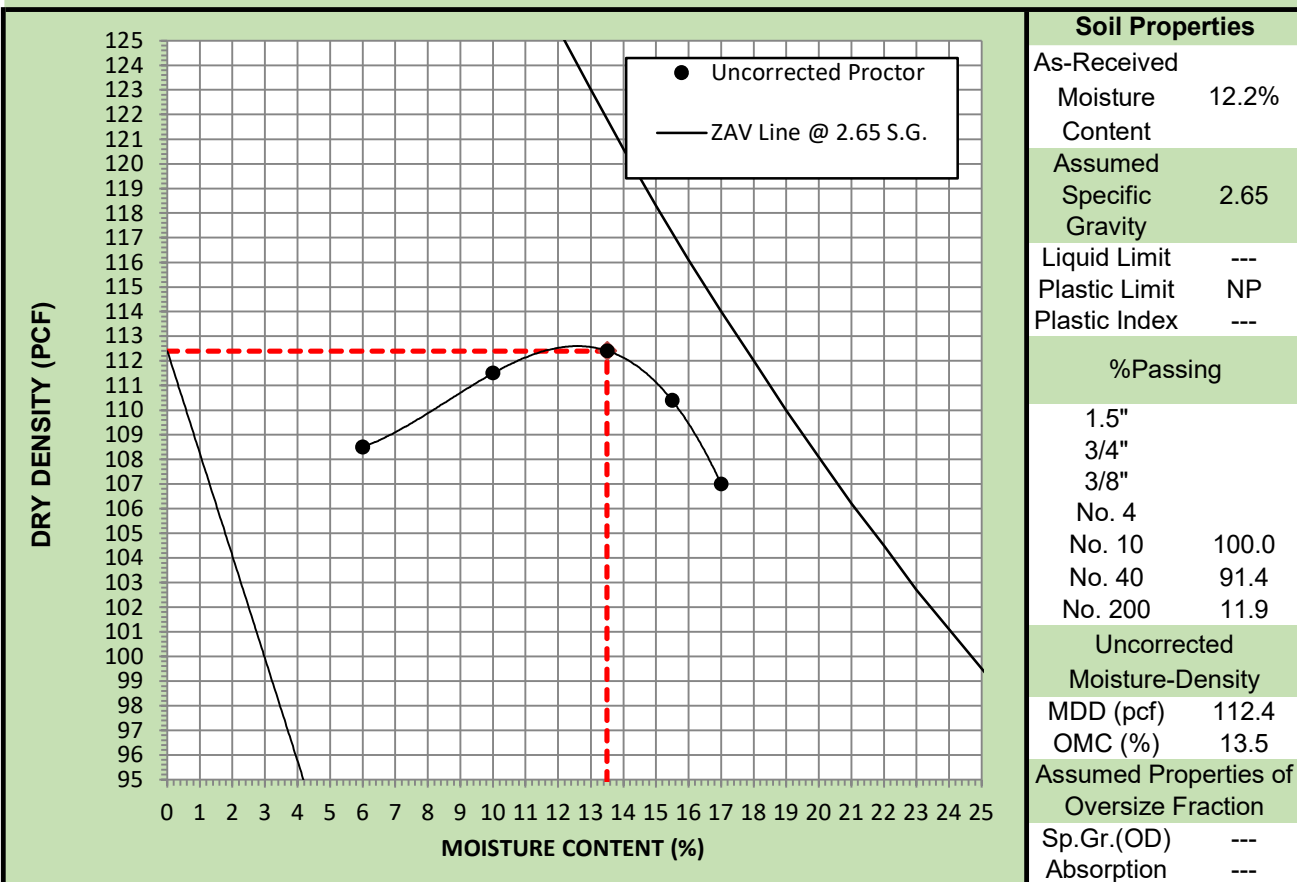
MOISTURE-DENSITY RELATIONSHIP REPORT**PROJECT INFORMATION**

Project #:	45231	Report Date:	3/20/2024
Project Name:	NC Forest Service Headquarters	Test Date(s):	2/12/2024
Project Location:	Duplin Co., NC	Tested By:	CAS
Client Name:	Williard Stewart Architects		

SAMPLE INFORMATION

Location:	B-3	Sample #:	Bulk	Sample Date:	3/8/2024
Depth:	1 to 5 feet	Offset:	N/A	Lab Control #:	1
Material Description:	Gray, medium to fine CLAYEY SAND (SC)				

Corrected Maximum Dry Density **112.4 PCF** **Corrected Optimum Moisture Content** **13.5 %**

ASTM D698 - Method A

The Moisture-Density Curve Displayed relates only to material passing a No. 4 sieve.

Air-dried material passing a No. 4 sieve was prepared then compacted with a circular, manual rammer.

References / Comments / Deviations:

Chris Smith

Technical Responsibility

Signature

Laboratory Manager

Position

3/20/24

Date

Information included in this report relates only to material sampled at the time of testing.

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**CBR (California Bearing Ratio) of
Laboratory Compacted Soil
ASTM D1883**

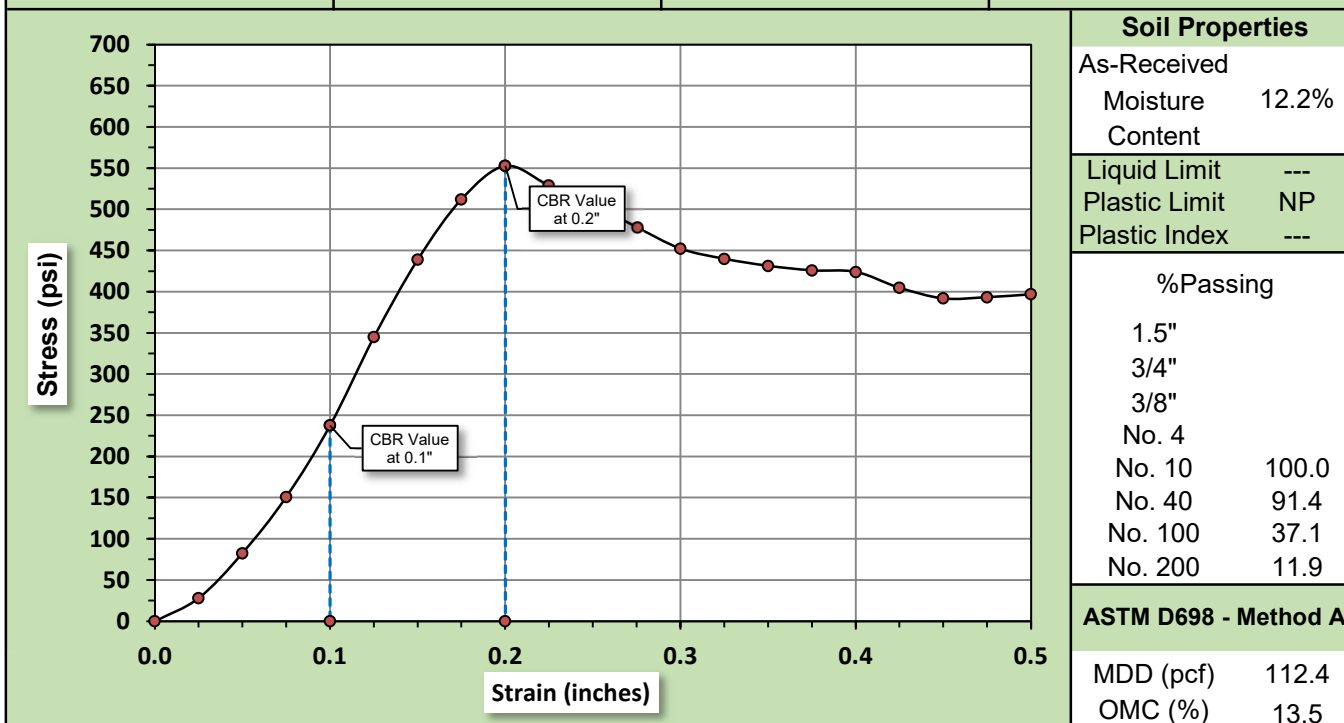
PROJECT INFORMATION

Project #:	45231	Report Date:	3/21/2024
Project Name:	NC Forest Service Headquarters	Test Date(s):	2/13-2/18/24
Project Location:	Duplin Co., NC	Tested By:	CAS
Client Name:	Williard Stewart Architects		

SAMPLE INFORMATION

Location:	B-3	Sample #:	Bulk	Sample Date:	3/8/2024
Depth:	1 to 5 feet	Offset:	N/A	Lab Control #:	1
Material Description:	Gray, medium to fine CLAYEY SAND (SC)				

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	23.8	CBR at 0.1 in	---
CBR at 0.2 in.	36.9	CBR at 0.2 in	---



Before Soaking		After Soaking	
Compactive Effort (Blows Per Layer)	56	Final Dry Density (pcf)	111.9
Initial Dry Density (pcf)	111.5	Average Final Moisture Content	14.2%
Moisture Content of Compacted Specimen	14.6%	Moisture Content (top 1" after soaking)	13.8%
Percent Compaction	99.2%	Percent Swell	0.1%

Soak Time (hours): 96 Surcharge Weight (lb): 10 Surcharge Stress (psf): 50.9
 ASTM D698 - Method A was performed on grading complying with CBR specification. % Retained on 3/4" sieve: 0.0
 ASTM D1883 was performed on the entire gradation compacted in a 6" CBR mold.

References / Comments / Deviations:

Chris Smith	_____ Signature	Laboratory Manager	3/21/24
Technical Responsibility		Position	Date

Information included in this report relates only to material sampled at the time of testing.

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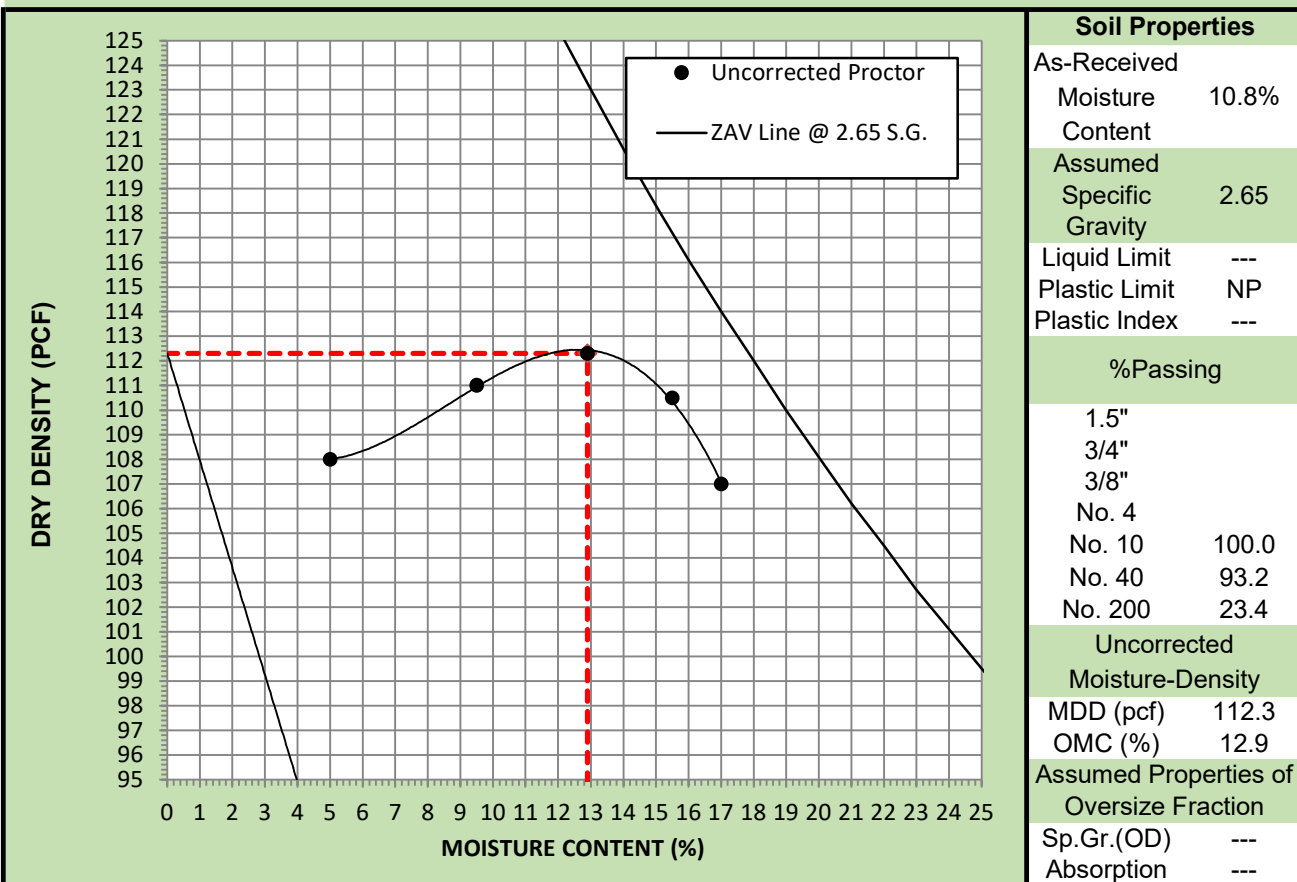
MOISTURE-DENSITY RELATIONSHIP REPORT**PROJECT INFORMATION**

Project #:	45231	Report Date:	3/20/2024
Project Name:	NC Forest Service Headquarters	Test Date(s):	#N/A
Project Location:	Duplin Co., NC	Tested By:	##
Client Name:	Williard Stewart Architects		

SAMPLE INFORMATION

Location:	B-11	Sample #:	Bulk	Sample Date:	3/8/2024
Depth:	1 to 5 feet	Offset:	N/A	Lab Control #:	2
Material Description:	Gray, medium to fine CLAYEY SAND (SC)				

Corrected Maximum Dry Density **112.3 PCF** **Corrected Optimum Moisture Content** **12.9 %**

ASTM D698 - Method A

The Moisture-Density Curve Displayed relates only to material passing a No. 4 sieve.

Air-dried material passing a No. 4 sieve was prepared then compacted with a circular, manual rammer.

References / Comments / Deviations:

##

Chris Smith

Technical Responsibility

Signature

Laboratory Manager

Position

3/20/24

Date

Information included in this report relates only to material sampled at the time of testing.

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Timmons Group / 430 Southlake Boulevard Suite B-15 Richmond, VA 23236 / p 804.200.6500

**CBR (California Bearing Ratio) of
Laboratory Compacted Soil
ASTM D1883**

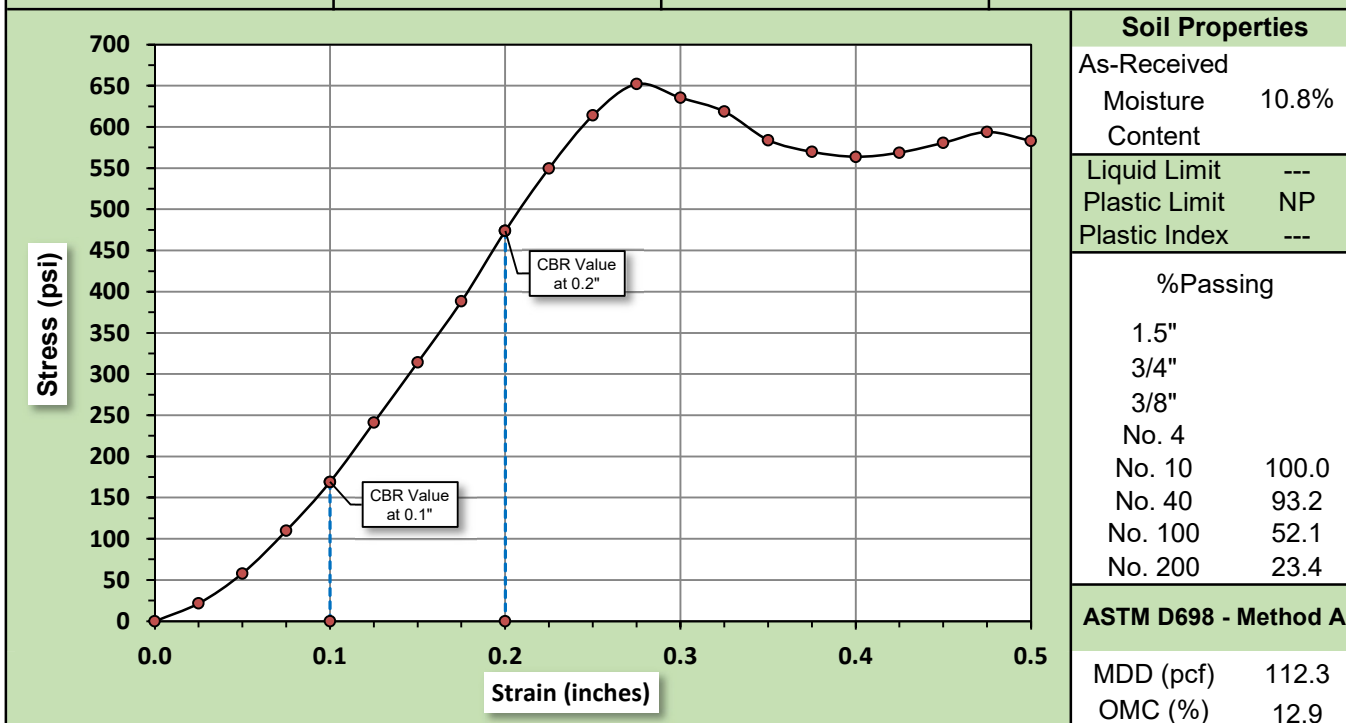
PROJECT INFORMATION

Project #:	45231	Report Date:	3/21/2024
Project Name:	NC Forest Service Headquarters	Test Date(s):	2/13-2/18/24
Project Location:	Duplin Co., NC	Tested By:	CAS
Client Name:	Williard Stewart Architects		

SAMPLE INFORMATION

Location:	B-11	Sample #:	Bulk	Sample Date:	3/8/2024
Depth:	1 to 5 feet	Offset:	N/A	Lab Control #:	2
Material Description:	Gray, medium to fine CLAYEY SAND (SC)				

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	16.9	CBR at 0.2 in.	31.6
		CBR at 0.1 in.	---
		CBR at 0.2 in.	---



Before Soaking		After Soaking	
Compactive Effort (Blows Per Layer)	56	Final Dry Density (pcf)	112.7
Initial Dry Density (pcf)	112.9	Average Final Moisture Content	13.0%
Moisture Content of Compacted Specimen	12.9%	Moisture Content (top 1" after soaking)	13.1%
Percent Compaction	100.5%	Percent Swell	0.0%

Soak Time (hours): 96 Surcharge Weight (lb): 10 Surcharge Stress (psf): 50.9
 ASTM D698 - Method A was performed on grading complying with CBR specification. % Retained on 3/4" sieve: 0.0
 ASTM D1883 was performed on the entire gradation compacted in a 6" CBR mold.

References / Comments / Deviations:

Chris Smith	_____ Signature	Laboratory Manager	3/21/24
Technical Responsibility		Position	Date

Information included in this report relates only to material sampled at the time of testing.

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Suite 102
Raleigh, NC 27607

P 919.866.4951
F 919.859.5663
www.timmons.com

May 13, 2025

Mr. Paul Stewart
Williard Stewart Architects
122 Cox Avenue
Raleigh, North Carolina 27605

Re: **Addendum to Geotechnical Engineering Report
Driven Pile Recommendations for Tank Support**
NC Forest Service Headquarters
Airport Road
Kenansville, North Carolina
Timmons Group Job No. 45231

Mr. Stewart:

Williard Stewart Architects has inquired about the use of driven pile foundations for support of the proposed 200,000-gallon steel ground-supported water storage tank. Timmons Group provided geotechnical recommendations for supporting the tank on mat foundation or structural concrete slab in our Geotechnical Engineering Report dated March 29, 2024. This Report included two borings (B-13 and B-14) in the proposed tank area.

This Addendum provides geotechnical recommendations for pile foundation support. We understand finished grade in the tank area will be approximately elevation 139 feet MSL.

PILE FOUNDATIONS

The proposed tank (in the vicinities of Boring B-13 and B-14) may be supported on driven 12-inch precast, prestressed concrete piles. These piles should be able to achieve an allowable axial compressive capacity of 60 tons per pile. This allowable capacity is based on a geotechnical factor of safety at least of 2.0. The anticipated production pile tip elevation ranges from elevation 105 to 84 feet (approximately 32 to 52 feet below an assumed bottom-of-pile cap elevation of 136 feet). This uncertainty in pile tip elevation is due to the very hard clay layer encountered between elevations 90 and 100 feet in Boring B-13 to B-14. Due to the thin nature of this layer, it is possible that piles achieve the required allowable axial compressive capacity within this hard clay layer. Once indicator piles are driven and tested, production pile length can be determined.

The recommended allowable capacity for individual 12-inch precast, prestressed concrete piles is summarized in the table below. We recommend the piles have a center to center spacing at least 3 times the pile width.

**Recommended Allowable Pile Capacity
For 12-inch Precast Prestressed Concrete Piles**

Anticipated Pile Embedment Depth (feet)*	Allowable Axial Compressive Capacity (tons)	Allowable Axial Uplift Capacity (tons)
32 to 52	60	13

* Corresponds to pile tip elevation of approximately 105 to 82 feet

Piles should be 12-inch precast, prestressed concrete piles and conform to the requirements of the American Society of Testing Materials (ASTM) standard specifications. Final tip depths should be based on driving resistance encountered and field observations. The pile driving equipment used during the test pile process should be used for the production piles. The equipment needs to be maintained and in good operating condition and should run at the same speed at all times. The piles should be protected using the appropriate cushion materials. It is the responsibility of the contractor to install the piles without any damage.

We recommend that at least three indicator piles be initially driven at locations selected by the Geotechnical Engineer to verify design recommendations presented and to establish driving criteria for the production piles. We recommend the indicator piles be at least 60 feet long. We recommend that production piles not be ordered until the indicator piles have been driven and load tested. The indicator piles may be used as production piles as long as they do not become damaged during the driving process, and they meet the required capacity. A load test should be performed for the indicator piles. Load testing may be conducted per ASTM D4945 (dynamic testing, e.g., pile driving analyzer) or ASTM D1143 (static load test). If load testing is conducted per ASTM D4945, we recommend that each indicator pile be load tested. For load testing per ASTM D1143, one load test is recommended, with the geotechnical engineer selecting the load test pile based on driving criteria.

The pile contractor should be licensed in North Carolina and have experience with the installation of driven concrete piles. Piles should not be out of plumb by more than 1%.

Piles should be driven using a hammer having sufficient energy to drive the piles to the recommended embedment depth and capacity. After selection of a contractor, we recommend the contractor submit for our review the specification data of the hammer that will be used to drive the piles. The hammer and pile system will then be analyzed using a “Wave Equation” program to determine the suitability of the hammer for its intended purpose. Driving criteria will also be established by Wave Equation Analysis.

PILE SETTLEMENT

Based on the assumed loading and our analysis, we expect that total foundation settlements for the pile supported foundations will be one-half inch or less.

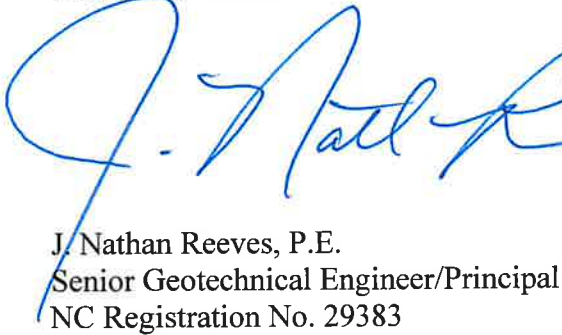
LIMITATIONS

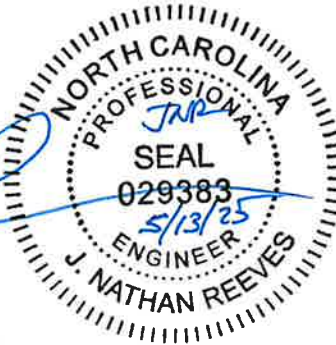
All prior limitations summarized in the referenced Geotechnical Engineering Report are applicable to this Addendum.

CLOSURE

We appreciate this opportunity to be of service to you on this project. If you have any questions regarding this addendum or if we can be of further assistance, please contact us at (919) 866-4951.

Respectfully submitted,
TIMMONS GROUP


J. Nathan Reeves, P.E.
Senior Geotechnical Engineer/Principal
NC Registration No. 29383



SECTION 024119 - SELECTIVE SITE DEMOLITION

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. Demolition and removal of selected site elements.
 - 2. Patching and repairs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01 Section "Construction Waste Management".
 - 2. Division 31 Section "Site Clearing" for site clearing and removing above- and below-grade improvements.
 - 3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Schedule of selective site demolition activities indicating the following:

1. Detailed sequence of selective site demolition and removal work, with starting and ending dates for each activity.
 2. Interruption of utility services.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of stairs.
 5. Detailed sequence of selective site demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 6. Coordination of Owner's continuing occupancy of existing buildings and of Owner's partial occupancy of completed Work.
- E. Inventory of items to be removed and salvaged.
- F. Record drawings at Project closeout according to Division 1 Section "Contract Closeout."
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
 2. Indicate unanticipated structural, electrical, or mechanical conditions.
- G. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- H. Photographs of existing conditions of areas of site which will be impacted by work prior to demolition and construction operations.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Predemolition Conference: Conduct conference at Project site to comply with preinstallation conference requirements of Division 1.

1.7 PROJECT CONDITIONS

- A. Owner assumes no responsibility for actual condition of site features to be selectively demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- C. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

- D. Should charted, uncharted or incorrectly charted utilities be encountered during demolition, contact the Architect immediately for instructions. Cooperate with Owner and utility companies to keep services and facilities in operation.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Unforeseen Conditions: Should unforeseen conditions be encountered that affect design or function of the project, investigate fully and submit an accurate, detailed, written report to the Architect. While awaiting the Architect's response, reschedule operations if necessary to avoid delay of overall project.
- G. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or as directed.

1.8 SCHEDULING

- A. Arrange selective site demolition schedule so as not to interfere with Owner's on-site operations.

1.9 WARRANTY

- A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective site demolition, by methods and with materials so as not to void existing warranties.

1.10 EXPLOSIVES AND BLASTING

- A. Use of explosives is not permitted.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. Architect shall review and approve all substitutions prior to installation.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective site demolition required.

- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective site demolition.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective site demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
- C. Utility Requirements: Refer also to Division 15 and 16 Sections for additional requirements for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective site demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Utility Adjustments and Relocaitons: Adjust locations, elevations and routes of existing utility lines, poles, guys, vaults, handholes, boxes, and other related appurtenances as required to facilitate new construction. Coordinate adjustments and relocations with utility companies.

3.3 PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations or as shown on the drawings.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective site demolition area.
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction or as shown on the plans.

2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
- C. Provide and maintain exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- D. Protect trees, fences, poles, mailboxes, and all other property unless their removal is authorized. Any property damaged, that is not authorized for removal, shall be restored or replaced to the Owner's satisfaction.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective site demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE SITE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete Work within limitations of governing regulations.
1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish asphalt, concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- C. Remove sawcut concrete and asphalt, including aggregate base, to a depth of 12-inches below existing, adjacent grade, or as indicated. Provide neat sawcut at limits of pavement removal as indicated.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective site demolition operations.
- B. Where repairs to existing surfaces are required, match previous work as closely as possible.
 - 1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly and dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Disposal: Transport demolished materials off Owner's property and legally dispose of them. Refer to Section 01505 – Construction Waste Management for additional requirements.

3.8 CLEANING

- A. Keep the site free from debris and hazards and inspect the site at the end of each day for trash. All adjacent roads and drives outside of the construction fencing shall remain in operation during construction and shall remain free of all construction materials and debris.

END OF SECTION 02 41 19

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section covers all cast-in-place structural concrete and accessories including forms, vapor barriers, reinforcement, finishing, curing, grout, waterstops, and joints in concrete slabs.
- B. Within this section, "General Contractor" refers to General Contractor and "Contractor" refers to the subcontractor responsible for the work in this section.

1.2 TOLERANCES

- A. Float and Broom Finish: Plane within 5/16" in 10' as determined by a 10' straightedge.
- B. Steel Trowel Finish:
 - 1. Slab-on-Grade:
 - a. Minimum Local Numbers: F_F15 and F_L10.
 - b. Minimum Overall Numbers: F_F20 AND F_L15.
 - 2. Elevated Slabs (F_L Not Applicable):
 - a. Minimum Local Number: F_F13.
 - b. Minimum Overall Number: F_F15.
- C. Formed Surfaces: ACI 301.
- D. Reinforcement (Fabricating and Placing): ACI 301.
- E. Other Tolerance Requirements: Conform to ACI 117.

1.3 SUBMITTALS

- A. In accordance with Division 1 furnish the following:
 - 1. Concrete Mix Design for each mix with evidence of strength per Section 2.3.
 - 2. Shop Drawings for reinforcing steel.
 - 3. Manufacturers' literature containing product information for admixtures, joint sealing materials, waterstops, and sealers.
 - 4. Concrete Test Results: See Section 3.8.

1.4 APPLICABLE PUBLICATIONS

- A. The publications (latest edition) listed below form a part of this Specification to the extent referenced. The publications are referenced in the text by the basic designation only.
1. American Society For Testing and Materials (ASTM).
 - a. A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - b. A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - c. C31 - Making and Curing Concrete Test Specimens in the Field.
 - d. C33 - Concrete Aggregates.
 - e. C39- Compressive Strength of Cylindrical Concrete Specimens.
 - f. C94 - Ready-Mixed Concrete.
 - g. C143 - Slump of Portland Cement Concrete.
 - h. C150 - Portland Cement.
 - i. C171 - Sheet Material for Curing Concrete.
 - j. C172 - Sampling Freshly Mixed Concrete.
 - k. C231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
 - l. C260 - Air-Entraining Admixtures for Concrete.
 - m. C494 - Chemical Admixtures for Concrete.
 - n. C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a mineral admixture in Portland Cement Concrete.
 - o. D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 2. American Concrete Institute (ACI).
 - a. 301 - Specification for Structural Concrete for Buildings.
 - b. 302.1R - Guide for Concrete Floor and Slab Construction.
 - c. 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - d. 305 - Hot Weather Concreting.
 - e. 306 - Cold Weather Concreting.
 - f. 315 - Details and Detailing of Concrete Reinforcement.
 - g. 318 - Building Code Requirements for Structural Concrete.
 - h. 347 - Recommended Practice for Concrete Formwork.

PART 2 - PRODUCTS

2.1 FORMS

- A. Forms may be wood, plywood, metal, or other materials, approved by the Engineer, of grade or type suitable to obtain type of finish specified.

2.2 MATERIALS FOR CONCRETE

- A. The following materials shall conform to the respective Specifications and other requirements specified herein.
1. Portland Cement: ASTM C150, Type I or II.
 2. Coarse Aggregate: ASTM C33.

- a. The nominal maximum size of coarse aggregate shall not be larger than:
 - 1) 1/5 the narrowest dimension between sides of forms.
 - 2) 1/3 the depth of slabs.
 - 3) 3/4 the minimum clear spacing between individual reinforcing bars or wires or bundles of bars.
 - 4) 3/8" for concrete used for filling masonry voids greater than 2".
 - b. No coarse aggregate shall be used in concrete for filling masonry voids less than 2".
 - c. Course aggregate shall be 3/4" or larger.
3. Fine Aggregate: ASTM C33. Do not use manufactured sands.
 4. Mixing Water: Fresh, clean and potable.
 5. Air-Entraining Admixture: ASTM C260.
 6. Chemical Admixture: ASTM C494.
 7. Pozzolan: ASTM C618, Class C or F.

2.3 CONCRETE MIXES

- A. Compressive strength and maximum slump (tests in accordance with ASTM C39 and C143, respectively) shall be as shown on Drawings.
 1. The strength of the concrete mixes proposed for use shall be established prior to beginning concrete operations. The concrete mix may be proportioned on the basis of field experience, trial mixes, or water cement ratio as stated in ACI 318. Evidence of concrete strength is to be submitted to the Engineer with the concrete mix design.
 2. Slump shall be as shown on drawings and shall be measured before the addition of H.R.W.R.
- B. A third generation high range water-reducing (HRWR) admixture conforming to ASTM C-494 shall be optional in all concrete mixes. Slump shall be measured before the addition of an HRWR when the HRWR is added at the site.
- C. Air-entrainment is required for all exterior concrete. Do not entrain air in concrete used for interior slabs. Air content shall conform to the following table:

<u>Nominal Maximum Size of Coarse Aggregate, Inches</u>	<u>Total Air Content Percent by Volume</u>
3/8	4.5 to 7.5
1/2	4 to 7
3/4	3.5 to 6.5
1	3 to 6
1-1/2	3 to 6

- D. Materials shall be stored, batched, and mixed as specified in ASTM C94.

2.4 VAPOR BARRIER

- A. Provide a vapor barrier where indicated on Drawings below slabs-on-grade. Use a laminated vapor barrier which is resistant to decay when tested in accordance with ASTM E 154. Select one (1) of the following:
 1. Moistop Ultra 6 by Fortifiber Corp.
 2. T-65 by Griffolyn.

3. Rufco 400 by Raven Industries.

2.5 REINFORCING STEEL

- A. ASTM A615, deformed Grade 60.

2.6 WELDED WIRE FABRIC

- A. ASTM A185, supplied in sheets.

2.7 PREFORMED (EXPANSION) JOINT FILLER

- A. ASTM D1751 or D1752, 1/2" thick unless noted.

2.8 BUILDING FELT

- A. 30 lb. asphalt saturated building-felt paper.

2.9 SHEET MATERIALS FOR CURING CONCRETE

- A. ASTM C171.

2.10 LIQUID CURING/SEALING COMPOUNDS

- A. For curing of floor slabs and foundations select one (1) of the following:
 1. "Masterkure" by Master Builders.
 2. "Super Rez-Seal" by Euclid Chemical Co.
 3. "Kure-N-Seal 30" by Sonneborn Building Products.
- B. For curing of formed surfaces select an oxidizing compound equal to Resi-Chem Clear Cure by Symons.
- C. Curing compounds shall not be used in areas to receive toppings, coatings, adhesives for floor coverings or paint without written certification of compatibility from the floor product manufacturer.

2.11 GROUT, NONSHRINKING

- A. Premixed nonmetallic, mixed and applied in accordance with manufacturer's recommendations. Grout shall show no settlement or vertical drying shrinkage based on initial measurement made at time of placement, and produce a compressive strength of at least 3,000 psi at three (3) days.

2.12 WATERSTOPS

- A. Unless noted otherwise on Drawings, waterstops shall be a pre-formed expandable hydrophilic rubber waterstop. Use MC-2010M by Adeka Ultra Seal or Hydrotite CJ-0725-3K by Greenstreak. Install per manufacturer's recommendations with appropriate accessory items.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Installation of formwork shall conform to ACI 347. Design, engineering, and construction of the formwork shall be the responsibility of the Contractor.

3.2 REINFORCEMENT

- A. Details of concrete reinforcement, unless otherwise shown, shall be in accordance with ACI 318, ACI 315, and ACI 301. All reinforcing steel shall be supported and securely tied to prevent displacement during the placing of concrete.

3.3 EMBEDDED ITEMS

- A. Embedded items shall be positioned accurately and supported against displacement.

3.4 VAPOR BARRIER

- A. Joints in vapor barrier shall be lapped 1'-0" or shall be sealed with tape.

3.5 PLACING, PROTECTION, AND CURING CONCRETE

- A. In normal weather conform to ACI 304.
- B. In cold weather conform to ACI 306R, except that the use of calcium chloride shall not be permitted.
- C. In hot weather conform to ACI 305R.
- D. Conform to ACI 302.1R, ACI 308 and as specified herein.
- E. Approved curing methods are as follows:
 - 1. Water curing by covering the entire surface of concrete with water. The curing water should not be more than twenty (20) degrees F cooler than the concrete.
 - 2. Water curing by fog spraying or sprinkling to provide a continuous film of water over the entire surface of concrete.
 - 3. Water curing by means of covering the entire surface with absorbent materials which shall be kept moist. Absorbent materials can be burlap, cotton mats, rugs, or other approved materials.
 - 4. Curing by means of covering the entire surface with waterproof sheet materials to reduce the loss of mixing water from the concrete.
 - a. Materials can be polyethylene sheeting, waterproof paper, or polyethylene coated burlap.
 - b. On slabs the sheets should extend over the edges at least twice the slab thickness.
 - c. During cold weather black polyethylene sheeting should be used.
 - d. During hot weather white polyethylene sheeting should be used.
 - e. Do not use polyethylene on slab surfaces that will be exposed.
 - 5. Curing by means of spraying or rolling a liquid membrane forming curing compound according to manufacturer's recommendations over the entire surface.

- a. A white-pigmented Class 2 compound shall be used when the concrete is exposed to the sun; otherwise use Class 1.
 - b. Curing compounds shall not be used in areas to receive toppings, coatings, adhesives for floor coverings or paint without written certification of compatibility from the floor product manufacturer.
 6. Formed surfaces shall be cured by moist curing with forms in place for the full curing period. If forms are removed early, then apply an oxidizing curing compound specified in Part 2.
- F. Minimum period of curing for all methods is seven (7) days unless a shorter period is approved by the Engineer.

3.6 FINISHES

- A. Vertical and Overhead Surface Finishes: Shall be as follows except where noted otherwise on the Drawings or Finish Schedule.
1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, or concealed will not require additional finishing.
 2. Interior and Exterior Exposed Areas (To Be Painted): All fins, burrs, and similar projections on surface shall be knocked off flush by mechanical means and rubbed lightly with a fine abrasive stone.
 3. Interior and Exterior Exposed Areas (Finished): Finished areas unless otherwise shown shall be given a smooth rubbed finish of uniform color, treated as follows:
 - a. Smooth Rubbed Form Finish:
 - 1) Use smooth high quality forms.
 - 2) Within seventy-two (72) hours after forms are removed, chip away all high spots and fill all air bubbles and small holes with a sand-cement-bonding agent grout proportioned to match the wall finish.
 - 3) Rub the entire surface of the wall with a fine abrasive stone to create a smooth surface, free of all form marks and holes.
 - 4) Do not finish wall by leaving a thin plastered layer of grout.
- B. Slab Finishes:
1. Scratch Finish: Slab surfaces to receive a bonded applied cementitious application shall all be thoroughly raked or wire broomed after partial setting (within two [2] hours after placing) to roughen surface to insure a permanent bond between base slab and applied cementitious materials.
 2. Float Finish: Unless noted otherwise, surfaces to receive a float finish shall include interior stair treads, equipment pads and surfaces intended to receive roofing or waterproofing membranes. After the concrete has been placed, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. During the first floating the slabs shall be checked for planeness of surface. The slab shall then be refloated immediately to a uniform sandy texture.
 3. Trowelled Finish: Unless noted otherwise, surfaces to receive a trowelled finish include exposed concrete floors and floors to receive resilient floor covering or carpet. The surface shall first be float-finished as specified above. It shall then be power trowelled, and finally hand trowelled such that the finished surface is essentially free of trowel marks and uniform in texture and appearance.
 4. Broom Finish: Unless noted otherwise, surfaces to receive a broom finish include exterior platforms, steps, and landings; and exterior and interior pedestrian ramps. Immediately after the concrete has received a float finish, it shall be given a coarse texture by drawing a broom across the surface and perpendicular to the direction of traffic.

5. Sealed Finish: See the Architectural Finish Schedule for all areas to be sealed. Apply a minimum of two (2) coats of the specified liquid curing/sealing compound per manufacturer's recommendations:
 - a. First Coat: Apply immediately after slab placement for curing and sealing.
 - b. Second Coat: Apply after the construction is substantially complete. Thoroughly clean the slab before applying the second coat.

C. Floor Slab Tolerances:

1. See Paragraph 1.2 of this Section for tolerances.
2. General Contractor shall measure for F_F and F_L tolerances for floors in accordance with ASTM E1155, within forty-eight (48) hours after slab installation.
3. Correct the slab surface if the actual F_F or F_L number for floor installation measures less than required.
4. Correct defects by grinding or removal and replacement of the defective work. Areas requiring corrective work will be identified. Remeasure corrected areas by the same process.

3.7 JOINTS

- A. A. Control joints in floor slabs shall be saw cut 1/8" wide by a depth equal to 1/4 the slab thickness unless shown otherwise on the Drawings. The slab shall be sawed as soon as the edges of the cut will not ravel.
- B. B. Construction joints shall be located by the Contractor in conformity with the predetermined joint layout. If concreting is interrupted long enough for the placed concrete to harden, a construction joint shall be used. The details of the joint shall be as shown on the Drawings.

3.8 TESTING

- A. Tests shall be made by an independent laboratory approved by the engineer. The cost of all testing shall be paid by the General Contractor.
- B. Samples: The testing agency shall obtain samples of fresh concrete in accordance with ASTM C172.
- C. Testing Frequency: The frequency of tests on each type of concrete shall be: One test per 50 cubic yards, one test per 5000 S.F. of surface area for slabs or walls, or one test minimum per day.
- D. Test Specimens: Each test shall consist of four (4) cylinders which are made and cured in accordance with ASTM C31 and tested in accordance with ASTM C39. One (1) cylinder shall be tested at seven (7) days, two (2) cylinders shall be tested at twenty-eight (28) days and one (1) kept as a spare.
- E. Slump: Determine the slump of concrete for each test in accordance with ASTM C143. If HRWR admixture is added at the site, the slump shall be measured before the addition of the admixture. If the HRWR is added at the concrete plant, the slump shall be measured at the site with the HRWR. The Engineer may occasionally request that the slump be measured at the plant before the HRWR is added.
- F. Air Content: Determine air content of concrete for each test only for the concrete requiring air entrainment. Air content tests shall be made in accordance with ASTM C231.
- G. Temperature: At each test record the temperature of each concrete sample and of the ambient air.

REGION 1 HEADQUARTERS

- H. Slab-on-Grade Flatness and Levelness: At the request of the Engineer the testing agency shall measure the F_F and F_L numbers for any of the slabs in accordance with ASTM E 1155.
- I. The testing agency shall report all test data in a Concrete Test Report to the General Contractor and A/E.
- J. The evaluation and acceptance of concrete shall be in accordance with ACI 318.

END OF SECTION 033000

SECTION 033516 - CONCRETE FLOOR SEALING AND HARDENING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes clear, sealing, and hardening coatings for horizontal traffic bearing concrete surfaces. Applications include coating either fresh or cured concrete surfaces at Contractor's option.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for curing compounds, curing, and sealing compounds.
 - 2. Division 03 Section "Honed and Polished Concrete Finishing" for polished concrete floors.
 - 3. Division 07 Section "Joint Sealants."

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include manufacturer's printed statement of VOC content.
- B. Qualification Data: For Installer.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Test Application: Apply a finish sample for each type of sealing and hardening coating and substrate required. Duplicate finish of approved sample.
 - 1. Locate each test application as directed by Architect.
 - 2. Size: 25 sq. ft.
 - 3. Final approval by Architect of sealing and hardening coating application will be from test applications.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.05 PROJECT CONDITIONS

- A. Protect concrete surfaces receiving sealing and hardening coatings in a manner acceptable coating manufacturer and applicator, that ensures that surface of concrete is maintained in condition without damage, deterioration, discoloring, or other surface imperfections that would impair aesthetic effect of final finish.
- B. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit sealing and hardening coatings to be applied according to manufacturers' written instructions and warranty requirements:
 - 1. Ambient temperature is above 40 deg F.
 - 2. Rain or snow is not predicted within 24 hours.
 - 3. Application proceeds more than 24 hours after surfaces have been wet.
 - 4. Substrate is not frozen, or surface temperature is above 40 deg F.
 - 5. Windy conditions do not exist that may cause sealing and hardening coating to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.01 SEALING AND HARDENING COATINGS

- A. Sealing and Hardener Coating: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces; and with 3.3 lb/gal. (400 g/L) or less of VOCs. Comply with the following:
 - 1. Wear Index per ASTM D-4060-90: Not greater than 0.6 when 500 cycles of abrasion with abrasive wheel number C-18 are recorded on coated concrete surface.
 - 2. Approved by USDA for food handling facilities and for resistance to chemical staining.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
 - 2. Curecrete Distribution Inc.; Ashford Formula.
 - 3. L&M Construction Chemicals, Inc.; Seal Hard.
 - 4. US Mix Products Company; US Spec Industraseal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean substrate of substances that might interfere with penetration or performance of sealing and hardening coatings. Test for moisture content, according to sealing and hardening coating manufacturer's written instructions, to ensure that surface is dry enough.
- B. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of sealing and hardening coating.

Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of sealing and hardening coating being deposited on surfaces. Cover live plants and grass.

- C. Coordination with Sealants: Do not apply sealing and hardening coating until sealants for joints adjacent to surfaces receiving sealing and hardening coating treatment have been installed and cured.
 - 1. Sealing and hardening coating work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, sealing, and hardening coating, and sealant materials identical to those used in the work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of sealing and hardening coating and to instruct Applicator on the product and application method to be used.
- B. Apply sealing and hardening coating according to manufacturer's written instructions.
 - 1. Apply sealer and hardener coating to fresh concrete or cured concrete under the following limitations:
 - a. Fresh Concrete Application: Apply sealer to fresh concrete only when authorized in writing by manufacturer, after concrete has received final finish, and as soon as feasible after concrete has hardened sufficiently to support sealer application operations.
 - b. Cured Concrete Application: Where manufacturer does not recommend application to fresh concrete, cure concrete for length of time recommended by manufacturer.
 - 1) Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs prior to coating application.
 - 2. Apply coating until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
 - a. Minimum Application Rate: Apply at no less than the manufacturer's recommended coating rate.

3.03 CLEANING

- A. Immediately clean sealing and hardening coating from adjoining surfaces and surfaces soiled or damaged by sealing and hardening coating application as work progresses. Repair damage caused by sealing and hardening coating application. Comply with manufacturer's written cleaning instructions.

3.04 PROTECTION

- A. Protect concrete surfaces as follows:
 - 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.

REGION 1 HEADQUARTERS

3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033516

FACILITIES OPERATIONS AND WAREHOUSE COMPLEX

WAKE TECHNICAL COMMUNITY COLLEGE

SECTION 033543 - HONED AND POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes finishing cast-in-place architectural concrete surfaces by honing, applying liquid treatment, and polishing. Applications include the following:
 - 1. Slabs-on-grade.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-In-Place Concrete" for finishing and curing requirements.
 - 2. Division 03 Section "Concrete Floor Sealing And Hardening."
 - 3. Division 07 Section "Joint Sealants" for elastomeric joint sealants in contraction and other joints in cast-in-place concrete slabs.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each liquid floor treatment component required.
- B. Qualification Data: For Installer.
- C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- D. Material Test Reports: For liquid floor treatment, from a qualified testing agency, indicating compliance with system physical properties specified.
- E. Minutes of preinstallation conference.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying liquid floor treatments similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to liquid floor treatment manufacturer.
 - 1. Engage an installer who employs only persons trained and approved by liquid floor treatment manufacturer for applying liquid floor treatment systems indicated.
 - 2. Engage an installer who is certified in writing by liquid floor treatment manufacturer as qualified to apply liquid floor treatment systems indicated.
- B. Source Limitations: Obtain primary liquid floor treatment materials through one source from a single manufacturer. Provide secondary materials, including honing and polishing material of type and from source recommended by manufacturer of primary materials.
- C. Field Sample Panels: Before casting concrete slab, produce field sample panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship of specified finish. Produce a minimum of 3 sets of full-scale panels, cast horizontally, approximately 48 by 48 by 4 inches minimum, to demonstrate the expected range of finish, color, and texture variations.

FACILITIES OPERATIONS AND WAREHOUSE COMPLEX

WAKE TECHNICAL COMMUNITY COLLEGE

1. Locate panels as indicated or, if not indicated, as directed by Architect.
 2. Demonstrate methods of finishing concrete, curing, cleaning, protecting, honing, applying liquid treatment, and polishing, as applicable. Include contraction joint in panel.
 3. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of surface blemishes to match adjacent undamaged surfaces.
 4. Maintain field sample panels as approved by Architect during construction in an undisturbed condition as a standard for judging the completed Work.
 5. Demolish and remove field sample panels when directed.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1. Require representatives of each entity directly concerned with cast-in-place concrete installation and concrete finishing work to attend.
 2. Review concrete finishes and finishing, concrete repair procedures, and concrete protection of cast-in-place concrete floor surfaces.

1.05 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 prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.06 PROJECT CONDITIONS

- A. Prior to honing, liquid treatment, and polishing operations comply with following:
1. Concrete shall have cured a minimum of 45 days.
 2. Protect concrete surfaces from staining by operations, materials, and products including the following:
 - a. Petroleum products including hydraulic fluids, oil, metal cutting lubricants, and waxes.
 - b. Rust and similar staining caused by corroding metal.
 - c. Acids and acidic detergents.
 3. Defer application of sealants to contraction and isolation joints until after work of this Section is complete.
- B. Environmental Limitations: Comply with liquid floor treatment manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid floor treatment application.
- C. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during honing, sealer, and polishing operations.
- D. Close spaces to traffic during honing, sealer, and polishing operations and for not less than 24 hours after polishing, unless manufacturer recommends a longer period.

1.07 SEQUENCING

- A. Trowel Finish: Floors receiving honed, sealed and polished finish shall be trowel finished in accordance with Division 03 Section "Cast-In-Place Concrete."

PART 2 - PRODUCTS

2.01 FLOOR AND SLAB TREATMENTS

FACILITIES OPERATIONS AND WAREHOUSE COMPLEX

WAKE TECHNICAL COMMUNITY COLLEGE

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Manufacturers: Subject to compliance with the requirements provide products by one of the following:
 - a. Advanced Floor Products
 - b. ARDEX Americas
 - c. AWRC Corporation
 - d. Euclid Chemical Company
 - e. H&C Decorative Concrete
 - f. Laticrete International
 - g. Moxie International
 - h. PROSOCO
 - i. Questmark
 - j. Vexson Chemicals
- B. Aggregate Exposure: Class B Finish 'Salt & Pepper'.
- C. Sheen/Gloss: Honed / Low Sheen.
- D. System Physical Properties: Provide liquid floor treatment system with the following comparative physical property requirements when tested according to test methods indicated:
 - 1. Abrasion Resistance: Up to 400 percent increase per ASTM C 779.
 - 2. Impact Strength: Up to 21 percent increase per ASTM C 805.
 - 3. UV and Water Spray: No adverse effect per ASTM G 23-81.
 - 4. Reflectivity: Up to 30 percent increase.
 - 5. Coefficient of Friction ASTM 1028 meet or exceed OSHA and ADA recommendations for wet and dry surfaces

2.02 ACCESSORY MATERIALS

- A. Neutralizing Agent: Tri-sodium phosphate (TSP).
- B. Water: Potable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. General: Prepare and clean substrates according to liquid floor treatment manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral pH substrate for liquid floor treatment application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with liquid floor treatment flooring.
 - 1. Repair damaged and deteriorated concrete according to liquid floor treatment manufacturer's written recommendations.
 - a. Use patching and fill material to fill holes and depressions in substrates according to liquid floor treatment manufacturer's written instructions.
 - 2. Hone concrete substrates using concrete honing equipment approved by liquid floor treatment manufacturer to produce sheen specified in Part 2 above and to match approved Field Sample Panel.
- C. Liquid Floor Treatment Materials: Mix components and prepare materials according to liquid floor treatment manufacturer's written instructions.

FACILITIES OPERATIONS AND WAREHOUSE COMPLEX

WAKE TECHNICAL COMMUNITY COLLEGE

3.02 LIQUID FLOOR TREATMENT APPLICATION

- A. Uniformly apply liquid floor treatment according to manufacturer's written instructions.
 - 1. Do not apply to concrete that is less than 45 days' old.
 - 2. Cure liquid floor treatment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3.03 POLISHING

- A. Polish treated, cured concrete surface using polishing equipment approved by liquid floor treatment manufacturer to produce surface sheen specified in Part 2 above and to match approved Field Sample Panel to satisfaction of Architect.
 - 1. Polish: Level 3, high sheet, 800 grit.
 - 2. Aggregate Exposure: Class C, medium aggregate, 1/8" cut.
 - 3. Maintain uniformity of sheen over contraction, expansion, and construction joints, unless otherwise indicated.
- B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
 - 1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 - 2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 - 3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 - 4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 - 5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 - 6. Control and dispose of waste products produced by grinding and polishing operations.
 - 7. Neutralize and clean polished floor surfaces.

3.04 REPAIRS, PROTECTION, AND CLEANING

- A. Repair and cure damaged finished surfaces of polished concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved Field Sample Panel.
 - 1. Remove and replace polished concrete that cannot be repaired and cured to Architect's approval.
- B. Protect corners, edges, and surfaces of polished concrete from damage; use guards and barricades.
- C. Protect polished concrete from staining, laitance, and contamination during remainder of construction period.
 - 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items on concrete surfaces.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

FACILITIES OPERATIONS AND WAREHOUSE COMPLEX

WAKE TECHNICAL COMMUNITY COLLEGE

- 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.
- D. Clean polished concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- E. Wash and rinse polished surfaces according to liquid treatment manufacturer's written recommendations. Protect other Work from staining or damage due to cleaning operations.
- 1. Do not use cleaning materials or processes that could change the appearance of polished concrete finishes.

END OF SECTION 033543

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Ties and anchors.
 - 6. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Steel lintels in unit masonry.
 - 2. Steel shelf angles for supporting unit masonry.
- C. Related Requirements:
 - 1. Section 072100 "Thermal Insulation" for cavity wall insulation.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- D. Samples for Verification: For each type and color of the following:
1. Exposed CMUs.
 2. Concrete face brick.
Special brick shapes.
 3. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 3. Mortar admixtures.
 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 5. Grout mixes. Include description of type and proportions of ingredients.
 6. Reinforcing bars.
 7. Joint reinforcement.
 8. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 - 1. Build sample panels for typical interior wall in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
 - 2. Build sample panels facing south.
 - 3. Clean exposed faces of panels with masonry cleaner indicated.
 - 4. Protect approved sample panels from the elements with weather-resistant membrane.
 - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 72 inches (1800 mm) high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.
 - 2. Clean exposed faces of mockups with masonry cleaner as indicated.
 - 3. Protect accepted mockups from the elements with weather-resistant membrane.
 - 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are dry (based on air-drying).
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. 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 TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (6 m) vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- C. CMUs: ASTM C90, Grade N.

1. Unit Compressive Strength:
 - a. Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
 - b. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
4. Finish: Exposed faces of the following general color, pattern, and texture as referred to on the drawings:
 - a. Lightweight aggregate, standard load bearing concrete masonry units.

2.5 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.10 MORTAR AND GROUT MATERIALS

- B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C91/C91M.
- F. Mortar Cement: ASTM C1329/C1329M.
- I. Aggregate for Mortar: ASTM C144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- J. Aggregate for Grout: ASTM C404.
- M. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

- N. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- O. Water: Potable.

2.11 REINFORCEMENT

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.
- B. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
- C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- D. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
 - 7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- E. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- F. Manufacturers: Subject to compliance with requirements, manufacturing offering joint reinforcement that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AA Wire Products, Co.
 - 2. Dur-O-Wal, Inc.
 - 3. Heckman Building Products, Inc.
 - 4. Hohmann & Barnard, Inc.
 - 5. Masonry Reinforcing Corp. of America.
 - 6. National Wire Products Industries.
 - 7. Southern Construction Products, Inc.
 - 8. Ty-Wall.

2.14 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.16 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.17 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type S.
 - 2. For reinforced masonry, use: Type S.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type S.
 - 5. For interior nonload-bearing partitions, Type S.
- F. Grout for Unit Masonry: Comply with ASTM C476. Grout for unit masonry shall be 3000 psi at 28 days.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that foundations are within tolerances specified.
 - 2. Verify that reinforcing dowels are properly placed.
 - 3. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. General: Comply with construction tolerances of referenced unit masonry standard.
- B. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- C. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.
- D. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in the following bond pattern ; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout three (3) courses / 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
 3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 1. With full mortar coverage on horizontal and vertical face shells.
 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread one full mortar bed including areas under cells.
 4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8 inch joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to be concealed or to be covered by other materials, unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
1. Space reinforcement not more than 16 inches (406 mm) o.c.
 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond opening in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry where indicated and as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (10 mm).
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY

- A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.
- B. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- C. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
- I. Prism Test: For each type of construction provided, according to ASTM C1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION 042000

SECTION 055000 - 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 metal fabrications:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Metal Thresholds and Treads.
 - 4. Metal bollards.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge type inserts and other items indicated to be cast into concrete.
 - 2. Division 4 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
 - 3. Division 13 Section "Metal Building Systems" for pre-engineered metal building system framing.
 - 4. Division 34 Section "Vehicle Barriers-Plastic Security Post Covers" for HDPE bollard covers.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing 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. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Product data for grout and non-shrink grout
- D. Samples representative of materials and finished products as may be requested by Architect.

- 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 a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," 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 recertification.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening 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. Differential values below (for aluminum in particular) are suitable for most of the U.S. Revise to suit local conditions. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

- C. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A 500.
 - 2. Hot-Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
- D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
 - 1. Galvanized finish for all installations.
- E. Gray-Iron Castings: ASTM A 48, Class 30.
- F. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- G. 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. 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 required, hot-dip galvanized per ASTM A 153.
- H. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

- C. Machine Screws: ANSI B18.6.3.
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
- F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 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.
 - 2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.
- J. Self-Drilling Tek Fasteners

- 1. Manufacturer: Buildex. A Division of Illinois Tool Works Inc., Elk Grove Village, Illinois.
- 2. Provide Self-drilling, Self-tapping fasteners in accordance with the following schedule unless otherwise noted on Structural Drawings / Specifications:

Fastener Schedule

Application:

Teks Screw Type

- | | |
|--|--|
| a. Connect 3/4" plywood to metal studs | With #10-24 x 1 1/2" wafer head self-drilling, self-tapping screws @ 6" o.c. at panel edges and intermediate supports. |
| b. 16 ga. cold rolled steel to .125 structural steel | #1-24 x 7/8" hex washer head, Tek/4 |
| c. 22 ga. steel .250 structural steel | #12-14 x 3/4" hex washer head heks/1 with pilot point |
- 3. Contractor shall verify with supplier that the above fasteners are proper for the listed applications.
 - 4. Provide 12-14 self-drilling fasteners to connect corrugated metal roof deck to structural steel. Provide stainless steel and EPDM sealing washers and stainless steel caps for corrosion resistance (Scots-Buildex).
 - 5. Powder actuated fasteners shall be as manufactured by: Hilti Fastening Systems; Tulsa, Oklahoma 74121.
 - 6. Material Specification

- a. Material: Modified AISI 1061 steel (austempered)
Rockwell Hardness 52-56 Rockwell C
Ultimate tensile strength = 285,000 PSI

- b. Plating: ASTM B633, SC. 1, Type III.

2.4 GROUT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Non-shrink, Nonmetallic Grouts:
 - a. Euco N-S Grout; Euclid Chemical Co.
 - b. Five Star Grout; Five Star Products.
 - c. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.

2.5 CONCRETE FILL - BOLLARDS

- A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

2.6 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Remove sharp or rough areas on exposed traffic surfaces.
- F. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- H. 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.
- I. 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.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.7 METAL SHIPS' LADDERS

- A. General: Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers, pipe and tube railings, and bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation. Comply with requirements of ANSI A14.3.
- B. Siderails: Provide 2" diameter continuous structural steel pipe side rails with eased edges spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch- (19-mm-) diameter steel bars, spaced 12 inches (300 mm) o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support ladder at top and bottom and at intermediate points spaced not more than 5 feet (1.5 m) o.c. with welded or bolted steel brackets.
1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches (180 mm).
 2. Extend side rails 42 inches (1.1 m) above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to the rung by a proprietary process.

- G. Galvanize ladders, including brackets and fasteners, in all locations.

2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.9 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 for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated. See Lintel Schedule.
- D. Hot dip galvanize loose steel lintels located in exterior walls.

2.10 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up 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 on exterior concrete framing.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

- a. Except as otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

C. Galvanize miscellaneous framing and supports in the following locations:

1. Exterior locations.
2. Interior locations where indicated.

2.12 METAL BOLLARDS

A. Fabricate pipe bollards from Schedule 80 steel pipe. Cap bollards with 1/4-inch (6.4-mm) minimum steel plate.

1. Where indicated for exterior bollards, use ornamental Reliance Foundry Model R7530 or equal. These bollards will not be equipped with chains.

B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve.

2.13 ABRASIVE METAL TREADS AND THRESHOLDS

A. Cast-Metal Units: Cast aluminum, with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.

1. Manufacturers (not limited to):
 - a. American Safety Tread Co., Inc.
 - b. Balco Inc.
 - c. Barry Pattern & Foundry Co., Inc.
 - d. Granite State Casting Co.
 - e. Safe-T-Metal Co.
 - f. Wooster Products Inc.

2.14 ABRASIVE METAL TREADS AND THRESHOLDS

A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.

1. Manufacturers (not limited to):
 - a. ACL Industries, Inc.
 - b. American Safety Tread Co., Inc.
 - c. Amstep Products.
 - d. Armstrong Products, Inc.
 - e. Balco Inc.
 - f. Granite State Casting Co.

g. Wooster Products Inc.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
3. Provide solid-abrasive-type units without ribs.
4. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

2.15 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly.

2.16 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- 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 "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 or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous 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 as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication 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 the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.

3.3 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 1. Use non-shrink, metallic grout in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING PIPE BOLLARDS

- A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with non-shrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.

- B. Fill bollards solidly with concrete, mounding top surface.

3.5 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosings on tread widths.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section "Joint Sealants" to provide a watertight installation.

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 same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."
- C. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Preassembled steel stairs with concrete-filled treads.
 - 2. Steel tube railings and guards attached to metal stairs.
 - 3. Steel tube handrails attached to walls adjacent to metal stairs.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 2. Section 055213 "Pipe and Tube Railings" for pipe and tube railings not associated with metal pan stairs.
 - 3. Section 099100 "Painting" for stair painting.
 - 4. Section 133419 "Metal Building Systems" for pre-engineered metal building systems.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs, railings, and guards.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
 - 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.
- D. Schedule installation of railings and guards so wall attachments are made only to completed walls.
 - 1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
 - 1. Prefilled metal-pan-stair treads.
 - 2. Abrasive nosings.
 - 3. Shop primer products.
 - 4. Handrail wall brackets.
 - 5. Grout.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
 - 3. Include plan at each level.
 - 4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
 - 5. Indicate profile and dimensions of precast terrazzo treads.
 - 6. Indicate profile and dimensions of epoxy-resin-filled treads.
- C. Samples for Verification: For each type and finish of nosing.
- D. Delegated-Design Submittal: For stairs and railings and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings and guards, including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. Component Importance Factor: 1.5.

2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing for Railings and Guards: ASTM A513/A513M.

2. Provide galvanized finish for exterior installations and where indicated.
- D. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, structural steel, **Grade 30 (Grade 205)**, unless another grade is required by design loads.
- F. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**, Alloy 6063-T6.

2.3 ABRASIVE NOSINGS

- A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Safety Tread Co., Inc.
 - b. Balco.
 - c. Ecoglo.
 - d. Granite State Casting Co.
 - e. Nystrom.
 - f. Wooster Products, Inc.
 3. Provide ribbed units, with abrasive filler strips projecting **1/16 inch (1.5 mm)** above aluminum extrusion.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.4 FASTENERS

- A. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, **ASTM A563 (ASTM A563M)**; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, **ASTM A563 (ASTM A563M)**; and, where indicated, flat washers.
 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.
 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Wall Brackets: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated. Bar-type. Center of rail 2-1/2 inches (63.5 mm) from face of wall.
- B. Welding Electrodes: Comply with AWS requirements.
- C. Shop Primers: Provide primers that comply with Section 099100 "Painting".
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings and guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Assemble stairs, railings, and guards in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish # 4 - Good quality, uniform undressed weld with minimal splatter.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 2. Locate joints where least conspicuous.
 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 4. Provide weep holes where water may accumulate internally.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Architectural Class, unless more stringent requirements are indicated.
- B. Stair Framing:
1. Fabricate stringers of steel plates, steel channels, or steel rectangular tubes.
 - a. Stringer Size: As required to comply with "Performance Requirements" Article.
 - b. Provide closures for exposed ends of channel and rectangular tube stringers.
 - c. Finish: Shop primed.
 2. Construct platforms of steel plate, channel, or rectangular tube headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
 - a. Provide closures for exposed ends of channel and rectangular tube framing.
 - b. Finish: Shop primed.
 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
 - a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than **0.067 inch (1.7 mm)**.
1. Steel Sheet: Uncoated, cold or hot-rolled steel sheet unless otherwise indicated.
 2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
 4. Shape metal pans to include nosing integral with riser.
 5. Attach abrasive nosings to risers.

6. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.

2.8 FABRICATION OF STAIR RAILINGS AND GUARDS

- A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."
- B. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
- C. Welded Connections: Fabricate railings and guards with welded connections.
 1. Fabricate connections that are exposed to weather in a manner that excludes water.
 - a. Provide weep holes where water may accumulate internally.
 2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 3. Weld all around at connections, including at fittings.
 4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 5. Obtain fusion without undercut or overlap.
 6. Remove flux immediately.
 7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 - Partially dressed weld with spatter removed as shown in NAAMM AMP 521.
- D. Form changes in direction of railings and guards as follows:
 1. By bending or by inserting prefabricated elbow fittings.
- E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of railing and guard members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
 1. Close ends of returns unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.
- H. Connect posts to stair framing by direct welding unless otherwise indicated.
- I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
 1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 2. For nongalvanized railings and guards, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 3. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides **1-1/2-inch (38-mm)** clearance from inside face of handrail to finished wall surface.

- J. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.
 - 1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.9 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
 - 1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
 - 1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
 - a. Clean bottom surface of plates.
 - b. Set plates for structural members on wedges, shims, or setting nuts.
 - c. Tighten anchor bolts after supported members have been positioned and plumbed.
 - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

- 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 2. Comply with requirements for welding in "Fabrication, General" Article.
- F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
 1. Install abrasive nosings with anchors fully embedded in concrete.
 2. Center nosings on tread width.

3.3 INSTALLATION OF RAILINGS AND GUARDS

- A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
 1. Space posts at spacing indicated or, if not indicated, as required by design loads.
 2. Plumb posts in each direction, within a tolerance of **1/16 inch in 3 feet (2 mm in 1 m)**.
 3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed **1/4 inch in 12 feet (6 mm in 3.5 m)**.
 4. Secure posts, rail ends, and guard ends to building construction as follows:
 - a. Anchor posts to steel by welding or bolting to steel supporting members.
 - b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.
- B. Attach handrails to wall with wall brackets.
 1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 2. Secure wall brackets to building construction as required to comply with performance requirements.

3.4 REPAIR

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with 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 (0.05-mm)** dry film thickness.

END OF SECTION 055113

SECTION 055213 - PIPE AND TUBE RAILINGS

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 pipe railings.

1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of [50 lbf/ ft. (0.73 kN/m) applied in any direction] [50 lbf/ ft. (0.73 kN/m) applied horizontally and concurrently with 100 lbf/ ft. (1.46 kN/m) applied vertically downward].
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

- B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. 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.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

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. Steel Pipe and Tube Railings:
 - a. Pisor Industries, Inc.
 - b. Sharpe Products.
 - c. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 STEEL AND IRON

- A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.

2.4 FASTENERS

- A. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- B. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials 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.

2.5 MISCELLANEOUS MATERIALS

- A. 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.
- B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide grout specifically recommended by manufacturer for exterior applications.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Close exposed ends of railing members with prefabricated end fittings.
- J. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

- K. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with steel plate forming bottom closure.

2.7 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.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
- B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, as recommended by manufacturer, mixed and placed to comply with anchoring material manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.5 PROTECTION

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Wood blocking, cants, and nailers.
 - 2. Wood furring and grounds.
 - 3. Rough carpentry work not specified elsewhere and generally intended for support of other work.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative, pressure process used, and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

- B. Warranty: Include warranty of chemical treatment manufacturer for each type of treatment.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency, including agency, grade, species, moisture content at time of surfacing, and mill.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: **19 percent** unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP U1; Use Category UC2.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic, chromium, or other agents classified as carcinogenic. Pressure-treated wood products shall not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and shall not be classified as hazardous waste.
 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Maximum Moisture Content: Kiln-dry materials after treatment to maximum moisture content indicated. Do not use material that is warped or does not comply with requirements for untreated material.
 - 1. Lumber: 19 percent.
 - 2. Interior construction panels: 15 percent.
- C. Minimum Waterborne Preservative retention: Pressure treat with waterborne preservatives to minimum retention indicated:
 - 1. Above-Ground Wood Treatment: 0.25 pcf.
 - 2. Ground-Contact Wood Treatment: 0.40 pcf.
- D. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. Application: Treat items indicated, 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 and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

- D. Identify fire-retardant-treated wood with appropriate classification marking of Underwriters Laboratories Inc. or other qualified testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
 - 1. Framing for raised platforms.
 - 2. Concealed blocking.
 - 3. Roof framing and blocking.
 - 4. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 - 5. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Concealed Conditions: No.2 or standard grade of any wood species listed by PS 20.
- B. Moisture Content: S-DRY, KD 19 or MC 19 (19 percent maximum moisture content).

2.5 CONSTRUCTION PANELS

- A. Standards: Comply with requirements of PS 1 Voluntary Product Standard "Construction and Industrial Plywood" for veneer plywood and APA PRP-108 "Performance Standards and Policies for Structural-Use Panels" for performance-rated panels.
 - 1. Trademark: Furnish construction panels that are each factory-marked w/ APA trademark for grade specified.
- B. Miscellaneous Concealed Plywood: C-C Plugged Exterior, thickness as indicated but not less than 1/2-inch (13-mm) nominal.
- C. Equipment Backing Panels: APA-Rated Sheathing, Exposure 1, fire-retardant treated, thickness as indicated, but not less than 15/32-inch.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Bolts: ASTM A307, Grade A with ASTM A563 hex nuts and flat washers.

2.7 METAL FRAMING ANCHORS

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, **G60 (Z180)** coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preserved-treated lumber and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Discard units of material with defects that impair quality of miscellaneous carpentry and in sizes that would require an excessive number of poor arrangement of joints.
- C. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than **16 inches (406 mm)** o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than **96 inches (2438 mm)** o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than **96 inches (2438 mm)** o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and **2-inch nominal (38-mm actual)** thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than **100 sq. ft. (9.3 sq. m)** and to solidly fill space below partitions.

- I. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- L. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with applicable codes and recognized standards.
- M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads except on exposed carpentry work. Fill holes.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring at 24 inches (610 mm) o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Wall sheathing.
 - 2. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
 - 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.
 - 1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
 - 2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.
- C. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preserved-treated plywood.
 - 2. Fire-retardant-treated plywood.
 - 3. Foam-plastic sheathing.
 - 4. Air-barrier and water-resistant glass-mat gypsum sheathing.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.
- B. Mockups: Build mockups to set quality standards for materials and execution.
 - 1. Build integrated mockups of exterior wall assembly at least **150 sq. ft. (14 sq. m)**, incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.
 - a. Include junction with building corner condition, and foundation wall intersection.
 - b. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, tie-ins to other installed air barriers, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
1. Manufacturers: Subject to compliance with requirements, provide products by acceptable manufacturer including, but not limited to the following:
 - a. CertainTeed.
 - b. Georgia-Pacific.
 - c. National Gypsum.
 - d. USG.
 2. Type and Thickness: **Regular, 5/8 inch (15.9 mm)** thick.
- B. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M, Type X, coated fiberglass mat gypsum sheathing with integral weather-resistant barrier and air barrier complying with ASTM E2178.
1. Manufacturers: Subject to compliance with requirements, provide products by acceptable manufacturer including, but not limited to the following:
 - a. Georgia-Pacific.
 - b. National Gypsum.
 - c. USG.
 2. Thickness: **5/8 inch (15.9 mm)** thick.
 3. Edges: Square.
 4. Flashing and Transitions Strips: As acceptable to sheathing manufacturer.
 5. Air Permeance: Maximum **0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa)** pressure difference when tested according to ASTM E2178.
 6. Vapor Permeance: Minimum **20 perms (580 ng/Pa x s x sq. m)** when tested according to ASTM E96/E96M, Desiccant Method, Procedure A.
 7. Sheathing Assembly Air Leakage: Maximum **0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa)** when tested according to ASTM E2357.
 8. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by sheathing manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C1002.
 - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
- D. 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.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a **3/8-inch (9.5-mm)** gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a **1/4-inch (6.4-mm)** 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, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately **8 inches (200 mm)** o.c. and set back a minimum of **3/8 inch (9.5 mm)** from edges and ends of panels.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately **8 inches (200 mm)** o.c. and set back a minimum of **3/8 inch (9.5 mm)** from edges and ends of panels.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
- F. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing:
 - 1. Install accessory materials according to sheathing manufacturer's written instructions and details to form a seal with adjacent construction, to seal fasteners, and ensure continuity of air and water barrier.
 - a. Coordinate the installation of sheathing with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - b. Install transition strip on roofing membrane or base flashing, so that a minimum of **3 inches (75 mm)** of coverage is achieved over each substrate.
 - 2. Connect and seal sheathing material continuously to air barriers specified under other Sections as well as to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
 - 3. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
 - 4. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip, so that a minimum of **3 inches (75 mm)** of coverage is achieved over each substrate. Maintain **3 inches (75 mm)** of full contact over firm bearing to perimeter frames, with not less than **1 inch (25 mm)** of full contact.
 - a. Transition Strip: Roll firmly to enhance adhesion.

REGION 1 HEADQUARTERS

5. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
6. Seal top of through-wall flashings to sheathing with an additional **6-inch- (150-mm-)** wide, transition strip.
7. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
8. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending **6 inches (150 mm)** beyond repaired areas in strip direction.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements.

END OF SECTION 061600

SECTION 062000 - FINISH 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. Interior standing and running trim for shop finish, field-touch up.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Division 6 Section "Plastic Laminate Clad Architectural Cabinets" for interior woodwork not specified in this Section.
 - 3. Division 9 Section "Painting" for priming and back-priming of finish carpentry.

1.3 DEFINITIONS

- A. Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NHLA - National Hardwood Lumber Association.
 - 3. NLGA - National Lumber Grades Authority.
 - 4. RIS - Redwood Inspection Service.
 - 5. SCMA - Southern Cypress Manufacturers Association.
 - 6. SPIB - Southern Pine Inspection Bureau.
 - 7. WCLIB - West Coast Lumber Inspection Bureau.
 - 8. WWPA - Western Wood Products Association.
- B. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.
- B. Samples for Verification:

1. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (203 by 250 mm) for panels.

- C. Research/Evaluation Reports: Showing that fire-retardant-treated wood complies with building code in effect for Project.
- D. Shop Drawings: Show layout of structural glued-laminated timber system and full dimensions of each member. Indicate species and laminating combination, adhesive type, and other variables in required work.
 1. Include large-scale details of connections.
 2. Include large-scale details of glazing/ doors/ etc.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide structural glued-laminated timber, including connectors, capable of withstanding structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117--DESIGN or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC- or APA-licensed firm.
 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA trademark. Place mark on surfaces that will not be exposed in the completed Work.
- B. Quality Standard: Comply with AITC A190.1, "Structural Glued Laminated Timber."
- C. Installer Qualifications: A qualified installer.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials are indicated, provide materials with specified fire-test-response characteristics as determined by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency on surfaces of materials that will be concealed from view after installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturer's written instructions and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
- B. Hardwood Plywood: HPVA HP-1.

2.2 INTERIOR STANDING AND RUNNING TRIM

- A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish): Clear, kiln-dried, white maple finished lumber (S4S).
- B. Moldings: Made to patterns included in WMMPA WM 7. Wood moldings made from kiln-dried stock and graded under WMMPA WM 4.

2.3 PANELING

- A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with applicable requirements in HPVA HP-1.
 - 1. Face Veneer Species: Maple
 - 2. Backing Veneer Species: Same species as face veneer.
 - 3. Construction: Veneer core.
 - 4. Thickness: 1/8 inch (3.2 mm).
 - 5. Panel Size: As shown on shop drawings approved by owner.
 - 6. Glue Bond: Type II (interior).

2.4 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.
- B. Paneling Adhesives: Comply with paneling manufacturer's written recommendations for adhesives.
- C. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.
- D. Sealants: Comply with requirements in Division 7 Section "Joint Sealants" for materials required for sealing siding work.

2.5 FABRICATION

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.
- B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
 - 1. Exterior standing and running trim wider than 5 inches (125 mm).
 - 2. Interior standing and running trim, except shoe and crown molds.
 - 3. Wood board paneling.
- C. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.
- D. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 1. Dress exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.

2.6 FACTORY FINISHING

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
 - 1. Grade: Premium.
- B. General: The entire finish of interior carpentry specified in this Section, regardless of whether shop applied or applied after installation.
 - 1. Shop Finishing: To the greatest extent possible, finish woodwork at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.
- D. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
- E. Washcoat for Stained Finish: Apply a vinyl washcoat to woodwork made from closed-grain wood before staining and finishing.
- F. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
- G. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.
 - 1. Grade: Premium.
 - 2. AWI Finish System TR-5: Catalyzed vinyl lacquer.
 - 3. Staining: Match approved sample for color.
 - 4. Sheen: Satin 30-50 gloss units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 - 4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

- A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 062000

SECTION 064116 - PLASTIC LAMINATE CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-faced architectural cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
- B. Related Requirements:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
 - 2. Division 06 Section "Solid Surface Countertops" for countertops at cabinets.
 - 3. Division 11 Section "Residential and Commercial Appliances" for appliances to be coordinated with cabinet construction.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product including: panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, fire-retardant-treated materials and cabinet hardware and accessories.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
- C. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 2. Thermoset decorative panels, 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish, with edge banding on one edge.
 - 3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of product including:
 - 1. Composite wood and agrifiber products.
 - 2. Thermoset decorative panels.
 - 3. High-pressure decorative laminate.

4. Adhesives.

- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. Regional Materials: Plastic-laminate cabinets shall be manufactured within 500 miles (800 km) of Project site.
- D. Certified Wood: Plastic-laminate cabinets shall be made from wood products certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- E. Type of Construction: Frameless.
- F. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

REGION 1 HEADQUARTERS

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Panolam Industries International, Inc.
 - e. Wilsonart International; Div. of Premark International, Inc.
- H. Laminate Cladding for Exposed Surfaces:
 1. Horizontal Surfaces: Grade HGS.
 2. Postformed Surfaces: Grade HGP.
 3. Vertical Surfaces: Grade HGS.
 4. Edges: Grade VGS
 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
 6. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 7. Drawer Bottoms: Thermoset decorative panels.
- I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- K. Colors, Patterns, and Finishes: Provide materials as indicated in the Finish Materials Schedule in the Drawings:

2.02 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.03 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 11 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

REGION 1 HEADQUARTERS

- E. Shelf Rests: BHMA A156.9, B04013; metal.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 2. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
 - 3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 - 4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.04 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.05 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate cabinets to dimensions, profiles, and details indicated.
- C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.02 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION 064116

SECTION 066000 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes solid-surface-material countertops and backsplashes.
- B. Related Sections:
 - 1. Division 06 Section "Plastic Laminate Clad Architectural Cabinets" for cabinets.
 - 2. Division 22 Section "Plumbing Fixtures" for sinks and plumbing fittings.

1.03 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Verification: For the following products:
 - 1. One full-size solid-surface-material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.04 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.05 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.01 SOLID-SURFACE-MATERIAL COUNTERTOPS

- A. Configuration: Provide countertops with the following front and backsplash style:
 - 1. Front: 1-1/2-inch laminated straight, 3/8 inch radius at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. Endsplash: Matching backsplash.
- B. Countertops: 1/2-inch thick, solid surface material with front edge built up with same material.
- C. Backsplashes And Sidesplashes: 1/2-inch thick, solid surface material.
- D. Fabrication: Fabricate tops in one piece. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes and sidesplashes for field assembly.

2.02 COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 - 1. Basis of Design Product: Subject to compliance with requirements provide the following:
 - a. DuPont de Nemours, Inc.; Corian product indicated on Drawing's Finish Schedule and Legend.
 - b. Or comparable product by, but not limited to, one of the following. Comparable products shall be submitted as substitution request in conformance with Section 01 25 00 "Substitution Procedures" primarily to for acceptance of matching color.
 - 1) Avonite Surfaces.
 - 2) Formica Corporation.
 - 3) Wilsonart International.
 - 2. Colors and Patterns: As indicated by manufacturer's designations on Drawing's Finish Schedule and Legend.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

END OF SECTION 066001

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Extruded polystyrene foam-plastic board insulation.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
 - 2. Section 092900 "Gypsum Board Assemblies" for sound-attenuation blanket used as acoustic insulation.
 - 3. Section 133419 "Metal Building Systems" for thermal insulation designed for pre-engineered metal buildings.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Extruded polystyrene foam-plastic board insulation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type V: ASTM C578, Type V, 100-psi (690-kPa) minimum compressive strength.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Owens Corning.
 - b. DuPont.
 - c. Soprema.
 - d. Sika.
 - 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation **12 inches (305 mm)** and wider in width.

2.2 INSULATION FASTENERS

- A. Spindles, Washers, Standoffs, and Anchors: As recommended by manufacturer for each product and application.

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** below exterior grade line.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. 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 072100

SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exposed-fastener, lap-seam metal wall panels.
 - 2. Concealed-fastener, lap-seam metal wall panels.
- B. Related Sections:
 - 1. Section 133419 "Metal Building Systems" for exposed-fastener, lap-seam metal wall panels and metal liner panels used on Building 02 | Maintenance Building.
 - 2. Section 133419 "Metal Building Systems" for metal panels used in horizontal soffit applications.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for metal panel assembly during and after installation.
 - 8. Review of procedures for repair of metal panels damaged after installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
 - 1. Include Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
 - 1. Metal Panels: **12 inches (305 mm)** long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal panel assembly, including [corner,] [soffits,] supports, attachments, and accessories.
 - 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 2. Warranty Period: **Two years** from date of Final Acceptance.
- B. Special Warranty on 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 specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: **20 years** from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering formed metal wall panels which may be incorporated in the work include, but are not limited to, the following:
 - 1. ATAS International, Inc.
 - 2. Berridge Manufacturing Company.
 - 3. Centria; a Nucor Brand.
 - 4. Englert, Inc.
 - 5. McElroy Metal.
 - 6. Metal Sales Manufacturing Corporation.
 - 7. Morin; a Kingspan Group Company.
 - 8. Pac-Clad Peterson; a Carlisle Company.
 - 9. Taylor Metal Products.
- B. Source Limitations: Obtain metal wall panels from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than **1/180** of the span.
- B. Air Infiltration: Air leakage of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: **6.24 lbf/sq. ft. (300 Pa)**.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: **6.24 lbf/sq. ft. (300 Pa)**.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations 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.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. Corrugated-Profile, Exposed-Fastener Metal Wall Panels [P2B]: Formed with alternating curved ribs spaced at **2.67 inches (68 mm)** o.c. across width of panel.
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, **Class AZ50 (Class AZM150)** coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: **0.024 inch (061 mm)**.
 - b. Exterior Finish: Two- or Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 2. Rib Spacing: **2.67 inches (68 mm)** o.c.
 - 3. Panel Coverage: Manufacturer standard.
 - 4. Panel Height: **0.75 inch (19 mm)**.
- C. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels [P1A]: Refer to Section 133419 "Metal Building Systems."

2.4 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile, Concealed-Fastener Metal Wall Panels [P3_/P3C]: Formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, **Class AZ50 (Class AZM150)** coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: **0.024 inch (061 mm)**.
 - b. Exterior Finish: Two- or Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 2. Panel Coverage: **12 inches (305 mm)**.
 - 3. Panel Height: **1.5 inches (38 mm)**.
- C. Reveal-Joint-Profile, Concealed-Fastener Metal Wall Panels [P4C]: Formed with vertical panel edges and a flat pan with centered recess between panel edges; with recessed joint between panels.
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, **Class AZ50**

(Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

- a. Nominal Thickness: 0.024 inch (061 mm).
 - b. Exterior Finish: Two- or Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
2. Panel Coverage: **12 inches (305 mm)**.
Panel Height: **1.5 inches (38 mm)**.
- D. Box Rib (Board-and-Batten), Concealed-Fastener Metal Wall Panels [P5A]: Formed with vertical panel edges and a flat pan with centered recess between panel edges; with recessed joint between panels.
1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.024 inch (061 mm).
 - b. Exterior Finish: Two- or Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 2. Panel Coverage: **12 inches (305 mm)**.
 3. Panel Height: **1 inch (25 mm)**.

2.5 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.6 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 - 2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 - 3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
 - 4. Stainless Steel Panels: Use stainless steel fasteners.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 - 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 - 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 - 5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum **6-inch (152-mm)** end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Metal Liner Panels: Install panels on interior side of girts with flush appearance on the inside.
- G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without 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 achieve waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

REGION 1 HEADQUARTERS

- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 076200 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Metal counter flashing and base flashing.
 - 2. Metal drip edges and gable end flashing.
 - 3. Other flashings as indicated on drawings.
 - 4. Miscellaneous sheet metal accessories.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data, Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- C. Samples of the following flashing, sheet metal, and accessory items:
 - 1. 8-inch-square samples of specified sheet materials to be exposed as finished surfaces.
 - 2. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
- D. Shop drawings showing layout, profiles, methods of joining, and anchorages details, including major counterflashings, trim/fascia units, gutters, downspouts, scuppers, and expansion joint systems. Provide layouts at 1/4-inch scale and details at 3-inch scale.

1.4 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.5 PERFORMANCE REQUIREMENTS

- A. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
 - 1. Wind Zone 1: Wind pressures of 21 to 30 psf

- B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

PART 2 - PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM MATERIALS

- A. Stainless Steel: AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; 0.0156-inch thick (28 gage) except as otherwise indicated or recommended by SMACNA "Architectural Sheet Metal Manual".
- B. Copper Sheet: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet.
- C. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
 - 1. Mill Finish: Standard two-sides bright.

2.2 FABRICATED UNITS

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible.
 - 1. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" 7th Edition and other recognized industry practices.
 - 2. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work.
 - 3. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material.
 - 4. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and solder.
- C. Expansion Provisions: Space movement joints at maximum of 30 feet with no joints allowed within 24 inches of corner or intersection.
 - 1. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

- E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Attachment Devices: Fabricate from same material as sheet metal component being anchored or from compatible, non-corrosive 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.

2.3 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Base Flashing: 26 Ga. thick Stainless Steel.
- C. Counterflashing: 26 Ga. thick Stainless Steel.
- D. Drip Edge: 20 Ga. thick Aluminum.
- E. Gable-End Metal Trim Edge: 20 Ga. thick Aluminum.
- F. Eave Flashing: 24 Ga. thick Stainless Steel.

2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Select materials so as to avoid galvanic action with adjacent materials.
- B. 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, non-corrosive, size and gage required for performance.
- C. Solder: For use with stainless steel, provide 60 - 40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.
- D. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
- E. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- F. Roofing Cement: ASTM D 2822, asphaltic.

2.5 STAINLESS STEEL

- A. Remove or blend tool and die marks and stretch lines into finish.
- B. Grind and polish surfaces to produce uniform directional textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 320-Grit Polished Finish: Oil-ground, uniform, smooth finish.

- D. Bright, Directional Polish: Match AISI No. 4 finish.
- E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "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. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashing into receivers installed by masonry work. Secure in a waterproof manner by means of interlocking folded seam, and sealant, in compliance with SMACNA. Lap counterflashing joints a minimum of 2 inches.
- C. 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.
- D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pre-tinned surface would show in finished Work.
 - 1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- E. 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.
- F. 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.

3.2 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Final Acceptance.

END OF SECTION 076200

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Rail-type, seam-mounted snow guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.
 - 1. Include details of rail-type snow guards.
- C. Samples:
 - 1. Rail-Type Snow Guards: Bracket, **12-inch- (300-mm-)** long rail, and installation hardware.
 - a. For units with factory-applied finishes, submit specified color.
- D. Delegated-Design Submittal: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include calculation of number and location of snow guards.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the jurisdiction in which the Project is located.
- B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

1.5 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design snow guards, including attachment to roofing material and roof deck, as applicable for attachment method, based on the following:
1. Roof snow load.
 2. Snow drifting.
 3. Roof slope.
 4. Roof type.
 5. Roof dimensions.
 6. Roofing substrate type and thickness.
 7. Snow guard type.
 8. Snow guard fastening method and strength.
 9. Snow guard spacing.
 10. Coefficient of Friction Between Snow and Roof Surface: 0.
 11. Factor of Safety: ≥ 2
- B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
1. Temperature Change: **120 deg F (67 deg C)**, ambient; **180 deg F (100 deg C)**, material surfaces.
- C. Structural Performance: Snow guards shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Snow Loads: As indicated on Drawings.
- D. Source Limitation: Provide complete snow guard system as designed and tested from single manufacturer.

2.2 RAIL-TYPE SNOW GUARDS

- A. Rail-Type, Seam-Mounted Snow Guards:
1. Manufacturers: Subject to compliance with requirements, provide products by acceptable manufacturer including, but not limited to the following:
 - a. S-5! Metal Roof Innovations, Ltd.
 - b. Alpine SnowGuards.
 - c. Sno Gem.
 - d. TRA Snow and Sun, Inc.
 2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail with integral track to accept color-matching inserts of material and finish used for metal roof.
 3. Brackets and Baseplate: **ASTM B209 (ASTM B209M)** aluminum; mill finished or clear anodized.
 4. Bars: **ASTM B221 (ASTM B221M)** aluminum; mill finish or clear anodized.

- a. Profile: Square with integral track to accept color-matching inserts of material and finish used for metal roof.
5. Seam clamps: **ASTM B221 (ASTM B221M)** aluminum extrusion or ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates for bonding snow guards.
- B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
 1. Space rows as indicated on approved Shop Drawings.
- B. Attachment for Standing-Seam Metal Roofing:
 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
 2. Rail-Type, Seam-Mounted Snow Guards:
 - a. Install brackets to vertical ribs in straight rows.
 - b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
 - c. Torque set screw according to manufacturer's instructions.
 - d. Install cross members to brackets.

END OF SECTION 077253

REGION 1 HEADQUARTERS**SECTION 079200 - JOINT SEALANTS****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 this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
 - 1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors and windows.
 - e. Control and expansion joints in ceiling and overhead surfaces.
 - f. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Joints between concrete paving units.
 - c. Tile control and expansion joints.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Joints between tops of non-load-bearing unit masonry walls and underside of cast-in-place concrete slabs and beams.
 - d. Tile control and expansion joints.
 - e. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - f. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - g. Perimeter joints of toilet fixtures.
 - h. Other joints as indicated.

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4. Interior joints in horizontal traffic surfaces as indicated below:
 - 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: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Standing Seam Metal Roofing" for sealing joints related to flashing and sheet metal for roofing.
2. Division 8 "Glass and Glazing" for sealants used in glazing.
3. Division 9 Section "Gypsum Board Assemblies" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.
4. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeter of acoustical ceilings.
5. Division 9 Section "Ceramic and Porcelain" for sealing tile joints.
6. Division 1 Sections "Environmental Impact of Materials" for other requirements.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data from manufacturers for each joint sealant product required.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Sustainability Submittals: Product Data for sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.
- E. Warranty: Special installers warranty specified in this Section.

1.5 QUALITY ASSURANCE

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- A. **Installer Qualifications:** Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. **Single Source Responsibility for Joint Sealant Materials:** Obtain joint sealant materials from a single manufacturer for each different product required.
- C. **Field-Constructed Mock-Ups:** Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:
 - 1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

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 period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. **Environmental Conditions:** Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
 - 2. When joint substrates are wet.
- B. **Joint Width Conditions:** Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. **Joint Substrate Conditions:** Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 WARRANTY

REGION 1 HEADQUARTERS

- A. Special Installers Warranty: Installer's standard form in which installer agrees 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 Final Acceptance.
- B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS**2.1 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, joint fillers, 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: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements, including those referenced for Type, Grade, Class, and Uses.
 - 1. One-Part Non-Acid Silicone Sealant (vertical non-working surfaces)
 - a. Type: S
 - b. Grade: NS
 - c. Class: 25
 - d. Use: M,G,A, O

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- e. Exposure: NT
 - f. Low Modulus: Tensile strength - 45 psi or less at 100% elongation when tested after 14 days at 77 deg F. and 50% relative humidity per ASTM D 412.
- 2. Multipart Non-Sag Urethane Sealant (horizontal traffic surfaces)
 - a. Type: S
 - b. Grade: P
 - c. Class: 25
 - d. Use: M
 - e. Exposure: T
- B. Available Products: Subject to compliance with requirements, elastomeric joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - 1. One-Part Non-Acid Silicone Sealant
 - a. Dow Corning: "790"
 - b. Pecora Corp: "864"
 - c. Tremco, Inc: "Spectrum 1"
 - d. Sonneborn: "Omniseal"
 - 2. Multipart Nonsag Urethane Sealant
 - a. Pecora Corp: "Dynatred"
 - b. Sonneborn: "Sonolastic NP"
 - c. Mameco: "Vulkem 227"

2.3 LATEX JOINT SEALANTS

- A. General: Provide manufacturer's standard one-part, non-sag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
- B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

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- D. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic-Emulsion Sealant:
 - a. "AC-20," Pecora Corp.
 - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
 - c. "Tremco Acrylic Latex 834," Tremco, Inc.
2. Silicone-Emulsion Sealant:
 - a. "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining 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 per ASTM E 90.
 2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
- C. Available Products: Subject to compliance with requirements, acoustical joint sealants that may be incorporated in the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. "SHEETROCK Acoustical Sealant," United States Gypsum Co.
 - b. "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.
 - c. "Quiet Zone" Acoustic caulk, Owens Corning, Corp.
 2. Acoustical Sealant for Concealed Joints:
 - a. "BA-98," Pecora Corp.
 - b. "Tremco Acoustical Sealant," Tremco, Inc.
 - c. "Quiet Zone" Acoustic caulk, Owens Corning, Corp.

REGION 1 HEADQUARTERS**2.5 PREFORMED FOAM SEALANTS**

- A. Preformed Foam Sealants: Manufacturer's standard preformed, pre-compressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in pre-compressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Open-cell polyurethane foam.
 2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in un-ruptured state.
 3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
 4. Any material indicated above.
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as 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.

2.7 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.

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- 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 in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Non-staining, 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. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 concrete, masonry, unglazed surfaces of ceramic tile, and similar 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.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other 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.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint

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sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant 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 printed installation instructions applicable to products and applications indicated, except where 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. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- F. Tooling of Non-Sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent

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to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Interior hollow-metal doors and frames.
 - 2. Exterior hollow-metal doors and frames.
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for building-in of anchors and grouting of frames in masonry construction.
 - 2. Section 081416 "Flush Wood Doors" for flush wood doors installed in hollow metal frames.
 - 3. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
 - 4. Section 088000 "Glass and Glazing" for hollow metal door glazing.
 - 5. Section 099100 "Painting" and Section 099600 "High Performance Coatings" for painting of hollow metal doors and hollow metal frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, and finishes.
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
- D. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Field quality control reports.
- B. Product Test Reports: For each type of hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

1.8 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch (102-mm) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include, but are not limited to, the following:
 - 1. Ceco Door; AADG, Inc.; ASSA ABLOY.
 - 2. Curries, AADG, Inc.; ASSA ABLOY Group.
 - 3. Custom Metal Products.
 - 4. Daybar Industries, Ltd.
 - 5. Pioneer Industries; AADG, Inc.; ASSA ABLOY.
 - 6. Republic Doors and Frames; a Allegion brand.
 - 7. Steelcraft Manufacturing Co.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than **0.38 deg Btu/F x h x sq. ft. (2.16 W/K x sq. m) when** tested according to ASTM C518.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of **0.053 inch (1.3 mm)**.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - 3. Exposed Finish: Factory prime for field painting.

2.4 EXTERIOR DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.
1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053-inch (1.3-mm), with minimum **A60 (ZF180)** coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - f. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - g. Core: Manufacturer's standard.
 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053-inch (1.3-mm), with minimum **A60 (ZF180)** coating.
 - b. Construction: Full profile welded.
 3. Exposed Finish: Factory prime for field painting.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Wherever 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 project site. Comply with ANSI/SDI-100 requirements.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.

- 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
- 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Floor Anchors: Secure with postinstalled expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.3 FIELD QUALITY CONTROL

- A. Repair or remove and replace installations that do not comply with specified requirements.
- B. Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

3.4 REPAIR

- A. Remove grout and other bonding material from hollow-metal work immediately after installation.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- C. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- D. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Solid-core flush wood veneer-faced doors.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Section 081113 "Hollow Metal Doors and Frames" for hollow metal frames for wood veneer doors.
 - 2. Section 087100 "Door Hardware" for door hardware for wood doors.
 - 3. Section 088000 "Glass and Glazing" for wood door glazing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Door core materials and construction.
 - 2. Door edge construction.
 - 3. Door face type and characteristics.
 - 4. Door louvers.
 - 5. Door trim for openings.
 - 6. Factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
 - 1. Door schedule indicating door location, type, size, fire protection rating, and swing.

2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Dimensions and locations of blocking for hardware attachment.
4. Dimensions and locations of mortises and holes for hardware.
5. Clearances and undercuts.
6. Requirements for veneer matching.
7. Doors to be factory finished and application requirements.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Special warranties.

1.7 QUALITY ASSURANCE

- A. ANSI/WDMA Quality Standard: I.S.1A "Architectural Wood Flush Doors".
- B. AWI Quality Standard: "Architectural Woodwork Quality Standards"; including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of WDMA quality standard.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of WDMA and AWI standards and manufacturer's written instructions.
 1. Comply with WDMA document "How to Store, Handle, Finish, Install, and Maintain Wood Doors".
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Identify each door with individual opening numbers which correlate with designation system used on Shop Drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between **25 and 55** percent during remainder of construction period.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.
- B. Contractor to replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Graham Wood Doors.
 - 2. Lambton Doors.
 - 3. Lynden Door.
 - 4. Masonite Architectural.
 - 5. Oregon Door.
 - 6. Oshkosh Door Company.
 - 7. VT Industries.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."

2.3 SOLID-CORE FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors:

1. Performance Grade:
 - a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated below or on Drawings.
 - b. ANSI/WDMA I.S. 1A Extra Heavy Duty: **Training / Command Room 128.**
2. ANSI/WDMA I.S. 1A Grade: Custom.
3. Faces: Veneer Grade: A.
 - a. Species: Select white maple.
 - b. Cut: Plain sliced (flat sliced).
 - c. Match between Veneer Leaves: Book match.
 - d. Assembly of Veneer Leaves on Door Faces: Balance match.
 - e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by **20 feet (6 m)** or more.
4. Exposed Vertical Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.
 - a. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: at least **475 lbf (2110 N)** in accordance with WDMA T.M. 10.
5. Core for Non-Fire-Rated Doors: Manufacturer's Standard.
6. Construction: Manufacturer's Standard.

2.4 LIGHT FRAMES AND LOUVERS

- ### A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular beads.
- ### B. Metal Louvers:
1. Blade Type: Vision-proof, inverted V.
 2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish.

2.5 FABRICATION

- ### A. Factory fit doors to suit frame-opening sizes indicated.
1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- ### B. Factory machine doors for hardware that is not surface applied.
1. Locate hardware to comply with DHI-WDHS-3.

2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
- C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 2. Finish faces, all four edges, edges of cutouts, and mortises.
 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
1. ANSI/WDMA I.S. 1A Grade: Custom.
 2. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Open-grain finish.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors:
 - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
 - 2. Machine doors for hardware.
 - 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 4. Clearances:
 - a. Provide **1/8 inch (3.2 mm)** at heads, jambs, and between pairs of doors.
 - b. Provide **1/8 inch (3.2 mm)** from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide **1/4 inch (6.4 mm)** from bottom of door to top of threshold unless otherwise indicated.
 - 5. Bevel non-fire-rated doors **1/8 inch in 2 inches (3-1/2 degrees)** at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Final Acceptance.

END OF SECTION 081416

SECTION 083113 - ACCESS 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Access doors and frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames.
- C. Coordination Drawings showing locations and quantities of Access Doors. Minimum scale: 1/8" = 1'-0".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Acudor Products Inc.
 - 2. Cesco Products.
 - 3. Karp Associates, Inc.
 - 4. Larsen's Manufacturing Co.
 - 5. Milcor, Inc.
 - 6. Nystrom, Inc.
 - 7. Jensen Industries, Inc.
 - 8. J.L. Industries, Inc.

2.2 MATERIALS

- A. Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Electrolytic zinc-coated steel sheet with Class C coating and phosphate treatment to prepare surface for painting.

2.3 ACCESS DOORS

- A. Noninsulated, Fire-Rated Doors for Gypsum Board Walls: Self-latching units consisting of frame, trim, door, and hardware, and complying with the following requirements:
 - 1. Frame: 0.0598-inch- (1.52-mm-) thick zinc-coated steel sheet.
 - 2. Door: 0.0598-inch- (1.52-mm-) thick zinc-coated steel sheet.
 - 3. Hinge: Continuous type.
 - 4. Latches: Bolt type, operated by either a ring turn or flush key device (keyed alike).
 - 5. Fire-Protection Rating for Walls: 1- hour.
- B. Flush Access Doors for Gypsum Board Walls and Ceilings: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:
 - 1. Frame: 0.0598-inch- (1.52-mm-) thick zinc-coated steel sheet.
 - 2. Door: 0.0747-inch- (1.90-mm-) thick zinc-coated steel sheet.
 - 3. Concealed, Gypsum Board Edge Trim: 0.0299-inch (0.76-mm) zinc-coated or galvanized-steel sheet with face flange formed to receive joint compound.
 - 4. Hinge: Concealed spring pin or continuous type.
 - 5. Locks: Key-operated cylinder lock.

2.4 FABRICATION

- A. General: Manufacture each access door assembly as an integral unit ready for installation.
- B. Steel Access Doors and Frames: Continuous welded construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flange: Nominal 1 to 1-1/2 inches (25.4 to 38.1 mm) wide around perimeter of frame.
 - 2. For gypsum board assemblies, furnish frames with edge trim for gypsum board or gypsum base.
- C. Locking Devices: Furnish number required to hold door in flush, smooth plane when closed.
 - 1. For cylinder lock, furnish 2 keys per lock and key all locks alike.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Advise Installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and

anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.2 **INSTALLATION**

- A. Comply with manufacturer's instructions for installing access doors.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.
- C. Install concealed-frame access doors flush with adjacent finish surfaces.

3.3 **ADJUST AND CLEAN**

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Service Doors.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
 - 5. Show locations of controls, locking devices, and other accessories.
 - 6. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: **Two (2) years** from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings.
 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- B. Windborne-Debris Impact Resistance: Provide impact-protective overhead coiling doors that pass ASTM E1886 missile-impact and cyclic-pressure tests according to ASTM E1996 for Wind Zone 3 for enhanced protection.

2.3 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACME Rolling Doors.
 - b. C.H.I.; a Nucor Company.
 - c. Clopay.
 - d. Cornell Innovative Door Solutions.
 - e. Hormann High Performance Doors.
 - f. Overhead Door Corporation.
 - g. Raynor Garage Doors.
- B. Operation Cycles: Door components and operators capable of operating for not less than **20,000**. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Insulated Door Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).
- D. Insulated Door Assembly U-Factor: 0.90 Btu/deg F x h x sq. ft. (5.1 W/K x sq. m).
- E. Door Curtain Material: Aluminum.
- F. Door Curtain Slats: Flat profile slats.
1. Insulated-Slat Interior Facing: Metal.
 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Manufacturer Standard.
- H. Curtain Jamb Guides: Manufacturer Standard.
- I. Hood: Match curtain material and finish.
- J. Locking Devices: Equip door with locking device assembly.
1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumbturn and outside with cylinder.
- K. Manual Door Operator (**DOOR 205; TYPE OH4**): Push-up operation.
- L. Electric Door Operator (**TYP.**):

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Wall.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. (2.44 m) or lower.
4. Motor Exposure: Exterior, wet, and humid.
5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar; self-monitoring type.
7. Control Station(s): Interior mounted.
8. Other Equipment: Audible and visual signals, Portable radio-control system.

M. Curtain Accessories: Equip door with weatherseals, push/pull handles, and pull-down strap.

N. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Finish as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with **G90 (Z275)** zinc coating; nominal sheet thickness (coated) of **0.028 inch (0.71 mm)**; and as required.
2. Aluminum Door Curtain Slats: **ASTM B209 (ASTM B209M)** sheet or **ASTM B221 (ASTM B221M)** extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of **0.050 inch (1.27 mm)**; and as required.
3. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
4. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm) and minimum aluminum thickness of 0.032 inch (0.80 mm).

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Galvanized Steel: Nominal **0.028-inch- (0.71-mm-)** thick, hot-dip galvanized-steel sheet with **G90 (Z275)** zinc coating, complying with ASTM A653/A653M.
 - 2. Aluminum: **0.040-inch- (1.02-mm-)** thick aluminum sheet complying with **ASTM B209 (ASTM B209M)**, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: As specified in Section 087100 "Door Hardware" and keyed to building keying system.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than **0.03 in./ft. (2.5 mm/m)** of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed 25 lbf (111 N).
- C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.11 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s):
 - 1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 - 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
 - G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
 - H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
 - I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
 - J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
 - K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.
 - L. Portable Radio-Control System: Consisting of **two** of the following per door operator:
 1. Three-channel universal coaxial receiver to open, close, and stop door.
 2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
- 2.12 GENERAL FINISHES**
- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
 - B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- 2.13 ALUMINUM FINSHES**
- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.14 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Aluminum-framed storefront systems.
 - 2. Aluminum-framed entrance door systems.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include drawings for each aluminum-framed entrance and storefront, showing the following:
 - a. Layout and installation details, including relationship to adjacent work.
 - b. Elevations at minimum 1/4-inch scale.
 - c. Detail sections of typical composite members.
 - d. Anchors and reinforcement.
 - e. Hardware mounting heights.
 - 3. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.

- 4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- 5. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. For Installer.
 - 2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Source quality-control reports.
- E. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Fabricator Qualifications: Provide aluminum entrances and storefront systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and that have a record of successful in-service

performance. The fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.

- C. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
 - 1. The Engineer shall carry a minimum of \$1,000,000.00 in professional liability insurance.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- E. Accessible Entrances: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA, Accessibility Guidelines for Buildings and Facilities (ADAAG)." ICC/ANSI A117.1.FED-STD-795, "Uniform Federal Accessibility Standards," and North Carolina Building Code Volume 1C.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: **Five** years from date of Final Acceptance.
- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: **20** years from date of Final Acceptance.
- C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, peeling, or chipping.

2. Warranty Period: **20** years from date of Final Acceptance.
- D. Refer to Division 8 section "Glass and Glazing" for specific warranty related to glass and glazing, which shall run concurrent with this warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard aluminum-framed entrances and storefronts which may be incorporated in the work include, but are not limited to, the following:
 1. Boyd Aluminum Mfg. Co.
 2. EFCO Corporation.
 3. Kawneer Company, Inc; Arconic Corporation.
 4. Leed Himmel Industries, Inc.
 5. Manko Window Systems Inc.
 6. Oldcastle Building Envelope.
 7. Trulite Glass & Aluminum Solutions.
 8. Tubelite.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 1. Wind Loads: As indicated on Drawings.

2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to **3/4 inch (19.1 mm)**, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than **1/8 inch (3.2 mm)**.
 - a. Operable Units: Provide a minimum **1/16-inch (1.6-mm)** clearance between framing members and operable units.
- E. Structural: Test according to ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at **150 percent** of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding **0.2 percent** of span.
 3. Test Durations: As required by design wind velocity, but not less than **10 seconds**.
- F. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than **6.24 lbf/sq. ft. (300 Pa)**.
- G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
 - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than **0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K)** as determined according to NFRC 100.
 2. Solar Heat-Gain Coefficient (SHGC):
 - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than **0.40** as determined according to NFRC 200.
 3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than **0.06 cfm/sq. ft. (0.30 L/s per sq. m)** at a static-air-pressure differential of **1.57 lbf/sq. ft. (75 Pa)** when tested according to ASTM E283.
 - b. Entrance Doors: Air leakage of not more than **1.0 cfm/sq. ft. (5.08 L/s per sq. m)** at a static-air-pressure differential of **1.57 lbf/sq. ft. (75 Pa)**.
 4. Condensation Resistance Factor (CRF): CRF for the system of not less than **55** as determined according to AAMA 1503.
- H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: **120 deg F (67 deg C)**, ambient; **180 deg F (100 deg C)**, material surfaces.

2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
 - c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

2.3 STOREFRONT SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Exterior Framing Construction: Thermally broken.
 2. Interior Vestibule Framing Construction: Nonthermal.
 3. Glazing System: Retained mechanically with gaskets on four sides.
 4. Glazing Plane: Front.
 5. Finish: Clear anodic finish, Color anodic finish, or High-performance organic finish, as scheduled or selected by Designer.
 6. Fabrication Method: Field-fabricated stick system.
 7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 8. Steel Reinforcement: As required by manufacturer.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
 1. Door Construction: **1-3/4-inch (44.5-mm)** overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 2. Door Design: **As indicated (Type SF1)** and **wide stile**; 5-inch (127-mm) nominal width (Typ.).
 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
 4. Finish: Match adjacent storefront framing finish unless scheduled otherwise..

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. General: Provide entrance door hardware for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- D. Continuous-Gear Hinges: BHMA A156.26.
- E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- F. Manual Flush Bolts: BHMA A156.16, Grade 1.
- G. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.
- H. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- I. Cylinders:
1. As specified in Section 087100 "Door Hardware."
 2. BHMA A156.5, Grade 1.
- J. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- K. Operating Trim: BHMA A156.6.
- L. Removable Mullions: BHMA A156.3 extruded aluminum.
1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.
- M. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- N. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

- O. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- P. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- Q. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- R. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of **1/2 inch (12.7 mm)**.

2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: [Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.7 MATERIALS

- A. Sheet and Plate: **ASTM B209 (ASTM B209M)**.
- B. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B221 (ASTM B221M)**.
- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.8 ACCESSORIES

- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from exterior.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: selected by Architect from full range of industry colors and color densities.
- C. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Set continuous sill members and flashing in full sealant bed or with gaskets, as recommended by manufacturer, to produce weathertight installation.
- D. Install joint filler behind sealant as recommended by sealant manufacturer.
- E. Install components plumb and true in alignment with established lines and grades.
- F. Entrance doors:
 - 1. Install doors to produce smooth operation and tight fit at contact points.
 - 2. Install exterior doors to produce weathertight enclosure and tight fit at weather stripping.

3.3 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 088000 "Glazing."

3.4 ERECTION TOLERANCES

- A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: **1/8 inch in 10 feet** (3.2 mm in 3 m); **1/4 inch in 40 feet** (6.35 mm in 12.2 m).
 - 2. Level: **1/8 inch in 20 feet** (3.2 mm in 6 m); **1/4 inch in 40 feet** (6.35 mm in 12.2 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to **1/2 inch** (12.7 mm) wide, limit offset from true alignment to **1/16 inch** (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from **1/2 to 1 inch** (12.7 to 25.4 mm) wide, limit offset from true alignment to **1/8 inch** (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of **1 inch** (25.4 mm) wide or more, limit offset from true alignment to **1/4 inch** (6 mm).
 - 4. Location: Limit variation from plane to **1/8 inch in 12 feet** (3.2 mm in 3.6 m); **1/2 inch** (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

- A. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Architect.
- B. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

- A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Final Acceptance, provide 12 months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

3.7 ENTRANCE DOOR HARDWARE SETS

- A. Entrance Door Hardware Sets are specified in Section 087100 "Door Hardware."

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:

1. Hinges.
2. Locks cylinders and keys.
3. Lock and latch sets.
4. Bolts.
5. Push/pull units.
6. Closers.
7. Overhead holders and door control devices.
8. Protection plates.
9. Weatherstripping and door sweeps for exterior doors.
10. Thresholds.
11. Silencers.
12. Key control system.
13. Electrified door hardware.

- B. Related Requirements:

1. Section 064113 "Wood-Veneer-Clad Architectural Cabinets" for cabinet door hardware provided with cabinets.
2. Section 081113 "Hollow Metal Doors and Frames".
3. Section 081416 "Flush Wood Doors" for elements provided as part of labeled fire-rated assemblies.
4. Section 083113 "Access Doors and Frames" for access door hardware, including cylinders.
5. Section 083323 "Overhead Coiling Doors" for door hardware provided as part of overhead coiling door assemblies.
6. Section 083463 "Detention Doors and Frames" for door silencers provided as part of detention frames.
7. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.
8. Section 087113 "Automatic Door Operators" for low-energy power operators and low-energy power-assist operators.
9. Division 26 Sections for connections to electrical power system and for low voltage wiring work.

10. Division 28 Sections for devices and connections provided as part of intrusion-detection and building fire alarm systems.

1.3 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory 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.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Keying Conference: Conduct conference at Project site.
 1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.
 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Building and space function, flow of traffic, and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For electrified door hardware.
 1. Include diagrams for power, signal, and control wiring.
 2. Include details of interface of electrified door hardware and building safety and security systems.
- C. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.

- D. Door Hardware Schedule: Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule. Schedule should be submitted within 30 days from date of Commencement of Contract.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
 - 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - e. Fastenings and other installation information.
 - f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - g. Mounting locations for door hardware.
 - h. List of related door devices specified in other Sections for each door and frame.
- E. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of electrified door hardware.
 - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

1.8 QUALITY ASSURANCE

- A. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Require supplier to meet with Owner and Architect as a prerequisite to preparation of Hardware Schedule, as described with respect to Door Hardware Allowance described elsewhere in this Section.
 - 2. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.
- B. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- D. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Final Acceptance unless otherwise indicated below:
 - a. Electromagnetic and Delayed-Egress Locks: Five years from date of Final Acceptance.
 - b. Exit Devices: Two years from date of Final Acceptance.
 - c. Manual Closers: 10 years from date of Final Acceptance.
 - d. Concealed Floor Closers: 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

- A. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines ICC/ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
 - 5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 - 1. Products:
 - a. HAGER BB1199 BB1279 BB1168 BB1193
 - b. MCKINNEY T4A3386 TA2714 T4A3786 TA2314
 - c. STANLEY FBB199 FBB168 FBB179 FBB191
 - d. HB IVES 5BB1HW 5BB1

Basis of Design Product: As identified in hardware schedule.

2.4 SELF-CLOSING HINGES AND PIVOTS

- A. Self-Closing Hinges and Pivots: BHMA A156.17.

2.5 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Pin-and-Barrel-Type Hinges:
- C. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 5/8-inch (16-mm) latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
- D. Lock Trim:
 - 1. Levers: Cast.
 - 2. Escutcheons (Roses): Cast.
 - 3. Dummy Trim: Match lever lock trim and escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch unless otherwise indicated.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 4. Recess-type Top Strike: For bolts locking into head frames.
- F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.
- G. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
- H. Interconnected Locks: BHMA A156.12; Grade 1; Series 5000.

2.7 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.36: Grade 1; with strike that suits frame.
- B. Mortise Auxiliary Locks: BHMA A156.36; Grade 1; with strike that suits frame.
- C. Narrow Stile Auxiliary Locks: BHMA A156.36; Grade 1; with strike that suits frame.
- D. Push-Button Combination Locks: BHMA A156.36; cylindrical; Grade 1; lock opens by entering a one- to five-digit code by pushing correct buttons in correct sequence; automatically relocks when door is closed; with strike that suits frame.

2.8 ELECTRIC STRIKES

- A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

2.9 ELECTROMAGNETIC LOCKS

- A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.
- B. Delayed-Egress Electromagnetic Locks: BHMA A156.24, electrically powered, with electromagnet attached to frame and armature plate attached to door; depressing push bar for more than three seconds initiates irreversible alarm and adjustable time delay for egress. When integrated with fire alarm, fire alarm voids time delay.

2.10 EXIT LOCKS AND EXIT ALARMS

- A. Exit Locks and Alarms: BHMA A156.29, Grade 1.

2.11 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.12 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Products:
 - a. Sargent 88 Series US32D
 - b. Von Duprin 99 Series US26D
 - c. Precision 2000 Series US32D
- Basis of Design Product: As identified in hardware schedule.

2.13 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Interchangeable.
- C. High-Security Lock Cylinders: BHMA A156.30; Grade 1 permanent cores that are removable; face finished to match lockset.
 - 1. Type: M, mechanical.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
- E. Products:

a.	Sargent	8200 LNJ	US26D
b.	Schlage	9000 03A	US26D
c.	Best	45H 3H	US26D

Basis of Design Product: As identified in hardware schedule.

2.14 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
 - 1. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
 - a. Provide three cylinder change keys and five each of master and grand master keys.
 - b. Provide one extra blank for each lock.
 - 2. Existing System:
 - a. Grand master key locks to Owner's existing system.
 - b. Factory key locks to existing key system for the **North Carolina Forest Service**.
 - 3. Change Key: Except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.15 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 - 1. Wall-Mounted Cabinet: Grade 1 cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

- B. Key Lock Boxes: Designed for storage of twenty keys.

2.16 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel unless otherwise indicated.

2.17 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

2.18 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
 - 2. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," provisions for door opening force.
 - 3. Provide grey resilient parts for exposed bumpers.
- B. Products:
 - a. Sargent 281 Series
 - b. LCN Closers 4040XP Series
 - c. Ryobi 4550 Series

Basis of Design Product: As identified in hardware schedule.

2.19 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.

2.20 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.

- B. Products:
- | | | | |
|----|---------------|-------------|-------|
| a. | Glynn Johnson | 900 Series | US32D |
| b. | Glynn Johnson | 454 Series | US32D |
| c. | ABH | 9020 Series | US32D |
| d. | ABH | 4400 Series | US32D |
| e. | Sargent | 590 Series | US26D |
| f. | Sargent | 1540 Series | US26D |

Basis of Design Product: As identified in hardware schedule.

2.21 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
 3. Gasketing on Double Doors: 0.50 cfm per ft. (0.000774 cu.) m/s per m) of door opening.

2.22 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.23 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

2.24 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units, BHMA A156 series standards for each specified door hardware unit, and BHMA A156.18. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite

face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.25 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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 of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions and DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: 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. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every **30 inches (750 mm)** of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every **30 inches (750 mm)** of door height greater than **90 inches (2286 mm)**.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule and as directed by Owner.
- F. Key Control System:
 - 1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 - 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
- G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 1. Configuration: Provide one power supply for each door opening with electrified door hardware.
- H. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- I. 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 will impede traffic.
- J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 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.
 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
 3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- B. Occupancy Adjustment: Approximately **12 months** after date of Final Acceptance, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

- A. Manufacturer List

<u>Code</u>	<u>Name</u>	<u>Code</u>	<u>Name</u>	<u>Code</u>	<u>Name</u>
AD	Adams Rite	LC	LCN Closers	SC	Schlage
GL	Glynn Johnson	PE	Pemko	VA01	Various
IV	Ives	RO	Rockwood	VO	Von Duprin

B. Hardware Set #1 – AL x AL

1. Doors: 101A, 119A, 121A
2. Hardware (For Each Door):

1	Continuous Hinge	112HD 83" EPT	US28	IV
1	Exit Device	RX 98L-NL x E996L-R&V 03	US26D	VO
1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D" KEYWAY	626	SC
1	Rim Cylinder	20-057 50-231 ICX	626	SC
1	Closer	4040 XP CUSH 30 SHOE SUPPORT 4040-18PA	AL	LC
		61 STOP SPACER		
1	Power Transfer	EPT 10	SP28	VO
1	Door Position Switch	DOOR POSITION SWITCH BY SECURITY VENDOR		VA01
1	Threshold	1715 A 36" MSES25SS		PE
3. Notes:
 - a. Card Reader x RX x DC.
 - b. Card Reader and Door Position Switch by Separate Security Contractor.

C. Hardware Set #2A – AL x AL

1. Doors: 101B
2. Hardware:

1	Continuous Hinge	112HD 83" EPT	US28	IV
1	Exit Device	RX 98L-NL x E996L-R&V 03	US26D	VO
1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D" KEYWAY	626	SC
1	Rim Cylinder	20-057 50-231 ICX	626	SC
1	Closer	4040 XP CUSH 30 SHOE SUPPORT 4040-18PA	AL	LC
		61 STOP SPACER		
1	Power Transfer	EPT 10	SP28	VO
1	Power Supply			
1	Door Position Switch	DOOR POSITION SWITCH BY SECURITY VENDOR		VA01
1	Remote Control/Release	660 SERIES CONCEALED REMOTE BUTTON		SC
3. Notes:
 - a. Remote Control/Release to be located in Admin Room 110. Room 110 to control access to Door 101B.
 - b. Card Reader x RX x DC.
 - c. Card Reader and Door Position Switch by Separate Security Contractor.

D. Hardware Set #2B – AL x AL

1. Doors: 119B
2. Hardware:

1	Continuous Hinge	112HD 83"	US28	IV
1	Door Pull	SET RM3311 72" OA. TYPE 5HD FASTENING	US32D	RO
1	Closer	4040 XP CUSH 30 SHOE SUPPORT 4040-18PA	AL	LC
		61 STOP SPACER		

E. Hardware Set #3 – HM x HM

1. Doors: 128C, 128D

2. Hardware (For Each Door):

1	Continuous Hinge	112HD 83" EPT	US28	IV
1	Exit Device	RX 98L-NL x E996L-R&V 03	US26D	VO
1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D" KEYWAY	626	SC
1	Rim Cylinder	20-057 50-231 ICX	626	SC
1	Closer	4040 XP HCUSH MC	AL	LC
1	Kickplate	8400 12" x 34"	US32D	IV
1	Power Transfer	EPT 10	SP28	VO
1	Door Position Switch	DOOR POSITION SWITCH BY SECURITY VENDOR		VA01
1	Kerf Weatherstripping	(KERFED FRAME)		VA01
1	Raindrip	346 C 40"		PE
1	Weatherstrip	309 AP 36"		PE
1	Weatherstrip	290 APK 1 x 36" 2 x 110"		PE

3. Notes:
 - a. Door Position Switch by Separate Security Contractor.

F. Hardware Set #4 – WD x HM

1. Doors: 105, 107, 110, 111, 113, 114, 115, 116, 117, 118, 120
2. Hardware (For Each Door):

3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
1	Lockset	L9050T 03A 50-231	626	SC
1	Cylinder Core	23-030 EVEREST D-RESTRICTED KKY GMK	626	SC
1	Wall Bumper	WS406/407CCV	US32D	IV

G. Hardware Set #4A – WD x HM

1. Doors: 103, 108, 108A
2. Hardware (For Each Door):

3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
1	Lockset	L9050T 03A 50-231	626	SC
1	Cylinder Core	23-030 EVEREST D-RESTRICTED KKY GMK	626	SC
1	Wall Bumper	WS406/407CCV	US32D	IV
1	Power Transfer	EPT 10	SP28	VO
1	Power Supply			
1	Door Position Switch	DOOR POSITION SWITCH BY SECURITY VENDOR		VA01

3. Notes:
 - a. Card Reader x RX x DC.
 - b. Card Reader and Door Position Switch by Separate Security Contractor.

H. Hardware Set #5 – WD x HM

1. Doors: 121, 128A, 128B
2. Hardware (For Each Door):

3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
1	Passage Lockset	L9010 03A	626	SC

	1	Wall Bumper	WS406/407CCV	US32D	IV
	1	Door Silencer	SR64	GRY	IV
I.	Hardware Set #6 – WD x HM				
1.	Doors: 129				
2.	Hardware:				
	3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
	1	Lockset	L9080T 03A 50-231	626	SC
	1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D" KEYWAY	626	SC
	1	Kickplate	8400 12" x 34"	US32D	IV
	1	Door Silencer	SR64	GRY	IV
J.	Hardware Set #7 – WD x HM				
1.	Doors: 102A, 108B, 120A				
2.	Hardware (For Each Door):				
	6	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
	1	Dust Proof Strike	DP2	US26D	IV
	2	Flush Bolt	FB458 12"	US26D	IV
	1	Lockset	L9080T 03A 50-231	626	SC
	1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D" KEYWAY	626	SC
	2	Overhead Door Holder	904H	US32D	GL
	2	Kickplate	8400 12" x 34"	US32D	IV
	2	Door Silencer	SR64	GRY	IV
K.	Hardware Set #8 – WD x HM				
1.	Doors: 123, 125				
2.	Hardware (For Each Door):				
	3	Hinges	5BB1HW 4 1/2 x 4 1/2	652	IV
	1	Pull Plate	8303-0 4 x 16	US32D	IV
	1	Push Plate	8200 8 x 16	US32D	IV
	1	Closer	4040 XP CUSH MC	AL	LC
	1	Kickplate	8400 12" x 34"	US32D	IV
	3	Door Silencer	SR64	GRY	IV
L.	Hardware Set #9 – WD x HM				
1.	Doors: 122, 124, 127, 210A				
2.	Hardware (For Each Door):				
	3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
	1	Lockset	L9080T 03A 50-231	626	SC
	1	Cylinder Core	23-030 EVEREST D-RESTRICTED KKY GMKM KEYWAY	626	SC
	1	Closer	4040 XP REG MC	AL	LC
	1	Overhead Door Holder	904H	US32D	GL
	1	Kickplate	8400 12" x 34"	US32D	IV
	3	Door Silencer	SR64	GRY	IV

M. Hardware Set #10 – HM x HM

1.	Doors: 207, 211D			
2.	Hardware (For Each Door):			
3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
1	Lockset	L9080T 03A 50-231	626	SC
1	Cylinder Core	23-030 EVEREST D-RESTRICTED KKY GMK	626	SC
1	Closer	4040 XP REG MC	AL	LC
1	Overhead Door Holder	904H	US32D	GL
1	Kickplate	8400 12" x 34"	US32D	IV
3	Door Silencer	SR64	GRY	IV

N. Hardware Set #11 – HM x HM

1.	Doors: 130			
2.	Hardware:			
2	Continuous Hinge	224HD 95"	US28	IV
1	Dust Proof Strike	DP2	US26D	IV
2	Flush Bolt	FB458 12"	US26D	IV
1	Lockset	L9080T 03A 50-231	626	SC
1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D"KEYWAY	626	SC
1	Closer	4040 XP HCUSH MC (Note: Active Leaf)	AL	LC
1	Overhead Door Holder	904H (Note: Inactive Leaf)	US32D	GL
2	Kickplate	8400 12" x 34"	US32D	IV
2	Door Position Switch	DOOR POSITION SWITCH BY SECURITY VENDOR		VA01
1	Kerf Weatherstripping	(KERFED FRAME)		VA01
1	Raindrip	346 C 76"		PE
1	Weatherstrip	309 AP 36"		PE
1	Threshold	1715 A 72" MSES25SS		PE

3. Notes:

- a. Door Position Switch by Separate Security Contractor.

O. Hardware Set #12 – HM x HM

1.	Doors: 201D, 201F, 201G, 202B, 211C			
2.	Hardware (For Each Door):			
1	Continuous Hinge	112HD 83" EPT	US28	IV
1	Exit Device	RX 98L-NL x E996L-R&V 03	US26D	VO
1	Cylinder Core	20-740 50-214 GMK PRIMUS EVEREST "D"KEYWAY	626	SC
1	Rim Cylinder	20-057 50-231 ICX	626	SC
1	Closer	4040 XP HCUSH MC	AL	LC
1	Kickplate	8400 12" x 34"	US32D	IV
1	Power Transfer	EPT 10	SP28	VO
1	Dr Position Switch	DOOR POSITION SWITCH BY SECURITY VENDOR		VA01
1	Kerf Weatherstripping	(KERFED FRAME)		VA01
1	Raindrip	346 C 40"		PE
1	Weatherstrip	309 AP 36"		PE

	1	Weatherstrip	290 APK 1 x 36" 2 x 110"		PE
	1	Threshold	1715 A 36" MSES25SS		PE
3.	Notes:				
	a.	Card Reader x RX x DC.			
	b.	Card Reader and Door Position Switch by Separate Security Contractor.			
P.	Hardware Set #13 – HM x HM				
	1.	Doors: 208, 209, 210			
	2.	Hardware (For Each Door):			
	3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
	1	Privacy Set	L9040 03A L283-722	626	SC
	1	Closer	4040 XP CUSH MC	AL	LC
	1	Kickplate	8400 12" x 34"	US32D	IV
	1	Smoke Seal	S88 BL 25'		PE
Q.	Hardware Set #14 – HM x HM				
	1.	Doors: 204			
	2.	Hardware:			
	6	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
	1	Dust Proof Strike	DP2	US26D	IV
	2	Flush Bolt	FB458 12"	US26D	IV
	1	Lockset	L9080T 03A 50-231	626	SC
	1	Cylinder Core	23-030 EVEREST D-RESTRICTED KKY GMK	626	SC
	1	Closer	4040 XP HCUSH MC (Note: Active Leaf)	AL	LC
	1	Overhead Door Holder	904H (Note: Inactive Leaf)	US32D	GL
	2	Kickplate	8400 12" x 34"	US32D	IV
	2	Door Silencer		SR64	GRY IV

END OF SECTION 087100

SECTION 087113 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Power door operators for swinging doors.

1.3 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Double-Egress (Doors): A pair of doors that simultaneously swing, with the two doors moving in opposite directions with no mullion between them.
- D. Double-Swing (Doors): A pair of doors that swing, with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.
- E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- F. For automatic door terminology, see **BHMA A156.10** for definitions of terms.

1.4 COORDINATION

- A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.
- B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.
- C. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to the following:
 - 1. Power supplies.
 - 2. Access-control system.
 - 3. Remote activation devices.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For automatic door operators.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 - 2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Indicate locations of activation and safety devices.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified, manufacturer's standard size.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of automatic door operator.
- C. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty or sporadic operation of automatic door operator, including controls.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
 - 2. Warranty Period: Two years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. ASSA ABLOY Entrance Systems.
 - 2. Falcon.
 - 3. Hager Companies.
 - 4. Horton Automatics.
 - 5. LCN.
 - 6. Nabco.
 - 7. SARGENT Manufacturing Company, ASSA ABLOY.
 - 8. Stanley Access Technologies.

2.2 AUTOMATIC DOOR OPERATORS, GENERAL

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and in accordance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
 - 1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
 - 2. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load indicated on Drawings.
- B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation, including spring closing when power is off.
 - 1. Power Unit: Control box and compressor unit, complete with tank, compressor, air line to operator, motor, regulator, safety valve, pressure cutoff switch, and automatic air-line filter drain.

- C. Hinges: See Section 087100 "Door Hardware" for hinge type for each door that door operator shall accommodate.
- D. Housing for Overhead Concealed Operators: Fabricated from minimum **0.125-inch- (3.2-mm-)** thick, extruded or formed aluminum and extending full width of door opening, including door jambs, to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
- E. Cover for Surface-Mounted Operators: Fabricated from **0.125-inch- (3.2-mm-)** thick, extruded or formed aluminum; continuous over full width of door opening, including door jambs; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- F. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 POWER DOOR OPERATORS FOR SWINGING DOORS

- A. Standard: BHMA A156.10.
- B. Performance Requirements:
 - 1. Opening Force:
 - a. Power-Operated Doors: Not more than **50 lbf (222 N)** required to manually set door in motion if power fails; not more than **15 lbf (67 N)** required to open door to minimum required width.
 - 2. Entrapment-Prevention Force: Not more than **40 lbf (178 N)** required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than **30 lbf (133 N)** required to prevent stopped door from moving in direction of closing.
- C. Configuration: Operator to control single swinging door.
 - 1. Traffic Pattern: Two way.
 - 2. Operator Mounting: Surface.
- D. Operation: Power opening and spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.10.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
 - 1. Adjustable opening and closing speed.
 - 2. Adjustable hold-open time from zero to 30 seconds.
 - 3. Adjustable limit switch.
 - 4. Obstruction recycle.

- H. Controls: Activation and safety devices in accordance with BHMA standards.
 - 1. Activation Device: Push-plate switch on each side of door to activate door operator.
 - 2. Safety Device: Presence sensor mounted on door header to detect pedestrians in presence zone and to prevent door from closing.
- I. Exposed Finish: Finish matching door and frame.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extrusions: **ASTM B221** (**ASTM B221M**).
 - 2. Sheet: **ASTM B209** (**ASTM B209M**).
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.
- C. Brass Sheet: ASTM B36/B36M, Alloy UNS No. C26000 (cartridge brass, 70 percent copper), in manufacturer's standard thickness.
- D. Bronze Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper) or Alloy UNS No. C23000 (red brass, 85 percent copper), in manufacturer's standard thickness.
- E. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 CONTROLS

- A. General: Provide controls, including activation and safety devices, in accordance with BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- C. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
 - 1. Configuration: Square push plate with **4-by-4-inch** (**100-by-100-mm**) junction box.
 - a. Mounting: As indicated on Drawings.
 - 2. Configuration: Rectangular push plate with **2-by-4-inch** (**50-by-100-mm**) junction box.
 - a. Mounting: Recess mounted in door jamb.
 - 3. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.
 - 4. Message: International symbol of accessibility and "Push to Open."

- D. Touchless Switch: Hands-free activation door-control switch with flat motion sensor face-plate with contrasting-colored, engraved message.
 - 1. Configuration: 1.75-by-4.5-inch (44.5-by-114.3-mm) jamb-style face plate.
 - a. Mounting: Recess mounted in door jamb.
 - 2. Face-Plate Material: Stainless steel with backlight acrylic window.
 - 3. Message: International symbol of accessibility and "Wave to Open" and wave symbol.
- E. Wireless or Remote Radio-Control Switch: Radio-control system consisting of header-mounted receiver and wall-mounted transmitter switch.
 - 1. Wall-Mounted Transmitter Switch: One red-button, momentary-contact actuator enclosed in 4-by-4-inch (100-by-100-mm) junction box. Provide blue plastic cover engraved with "Press Button to Open" in white text and with international symbol of accessibility.
- F. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.6 ACCESSORIES

- A. Signage: As required by cited BHMA standard for type of door and its operation.
 - 1. Application Process: Operator manufacturer's standard process.

2.7 FABRICATION

- A. Factory fabricate automatic door operators to comply with indicated standards.
- B. Form aluminum shapes before finishing.
- C. Fabricate exterior components to drain condensation and water-passing joints within operator enclosure to the exterior.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.
- E. Provide metal cladding, completely covering visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary, protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install automatic door operators in accordance with manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
 - 1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
 - 2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- B. Controls: Install activation and safety devices in accordance with manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Access-Control System: Connect operators to access-control system as specified in Section 281500 "Access Control Hardware Devices."
- D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 ADJUSTING

- A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - 1. Adjust operators on exterior doors for tight closure.
- B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- D. Occupancy Adjustment: When requested within 12 months of date of Final Acceptance, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Final Acceptance, maintenance service shall include 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
 - 2. Perform maintenance, including emergency callback service, during normal working hours.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 087113

REGION 1 HEADQUARTERS**SECTION 088000 - GLASS AND GLAZING****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 glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Exterior window units.
 - 2. Exterior storefronts.
 - 3. Entrances and other doors.
 - 4. Door vision lites - tempered and wired glass.
 - 5. Wired glass door sidelites.
 - 6. Interior storefronts.
- B. Related Sections: The following sections contain requirements that relate to this Section.
 - 1. Framing requirements for aluminum entrances and storefront, including entrances specified to be factory glazed, are included in Division 8 Section "Aluminum Storefront Window System"
 - 2. Interior Storefront framing system is included in Division 8 Section "Standard Steel Doors and Frames"
 - 3. Lock cylinders are included in Division 8 Section "Finish Hardware."

1.3 DEFINITIONS

- A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.
- B. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.
- 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

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cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.
- B. Glass Design: Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Minimum glass thickness, nominally, of lites in exterior walls is 6.0 mm (0.23 inch).
 - b. Specified Design Wind Loads: As indicated.
 - c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - 3) For laminated-glass lites.
 - 2. Tinted and heat-absorbing glass thicknesses for each tint indicated are the same throughout Project.
 - 3. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:
 - a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.
- C. Thermal Movements: Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

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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.
 2. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch- (12.7-mm-) wide interspace.
 3. 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.

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material indicated.
- C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.
- D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
- E. Preconstruction Adhesion Compatibility Test Report: From glazing sealant manufacturer indicating that glazing sealants were tested for adhesion to glass and glazing channels substrates and for compatibility with glass and other glazing materials.
- F. Sample Warranties: Special warranties specified in this Section.
- G. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.
- H. Sustainability Submittals:
 1. For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

REGION 1 HEADQUARTERS**1.6 QUALITY ASSURANCE**

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. FGMA Publications: "FGMA Glazing Manual."
 2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines"
 3. AAMA Publications: AAMAGDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
- C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
1. Insulating Glass Certification Council (IGCC).
 2. Associated Laboratories, Inc. (ALI).
 3. National Certified Testing Laboratories (NCTL).
- E. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- F. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
1. Primary glass of each (ASTM C 1036) type and class indicated.
 2. Heat-treated glass of each (ASTM C 1048) condition indicated.
 3. Insulating glass of each construction indicated.
- G. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

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- H. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- B. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

- A. Submit a written warranty made out to the Owner and signed by glass manufacturer agreeing to furnish replacements for glass units that deteriorate as defined in "Definitions" article f.o.b. the nearest shipping point to the Project site, within specified warranty period indicated below.
 - 1. 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:
 - a. Warranty Period: 5 years from date of Final Acceptance.
 - 2. 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:
 - a. Warranty Period: 10 years from date of Final Acceptance.
 - 3. 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:

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a) Warranty Period: 10 years from date of Final Acceptance.

4. Manufacturer's Special Warranty for Mirror Glass: Manufacturer's standard form, made out to Owner and signed by mirrored-glass manufacturer agreeing to replace mirrored-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

a. Warranty Period: 5 years from date of Final Acceptance.

5. Special Warranty period for Weather Tightness: 5 years from date of Final Acceptance.

- a. Signed by Contractor and Installer.
b. Failure is defined as water leakage through glazing assembly.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Exterior glass is based on Oldcastle Building Envelope. Exterior glazing shall meet current energy code to provide a solar gain coefficient of 0.25 or better. Subject to compliance with requirements, provide products by one of the following:
1. Float Glass
 - a. Oldcastle Building Envelope
 - b. AFGD, Inc.
 - c. Pilkington Building Products North America
 - d. PPG Industries
 - e. Viracon, Inc.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1035, Type I (Transparent Flat Glass), Quality-Q3; of class indicated.
- 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-weave 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.

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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 of Kind HS (heat-strengthened) float glass where safety glass is indicated.
- C. Insulating-Glass Units, Genera: 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 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.
 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating glass units are nominal and the overall thickness of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 4. Sealing System: Dual seal, with primary and secondary sealants.
 5. Spacer Specifications: Manufacturer's standard spacer materials and construction.
- D. Laminated Glass – All Exterior Openings: Clear laminated glass with two piles of fully tempered float glass.
1. Thickness of Each Laminated Glass Ply
 - a. Sheet #1: 0.128", 0.030", 0.128"
 - b. Gap: 0.526"
 - c. Sheet #2: 0.130", 0.030", 0.130"
 2. Provide safety glazing labeling.
- E. Glass Mirrors: ASTM C 1503, manufactured using copper-free, low-lead mirror coating process.
1. Clear Glass: Mirror select quality, 1/4-inch thick, ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.
- F. 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 a watertight seal:
1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic Polyolefin Rubber, ASTM C 1115.
- G. 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:

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1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic Polyolefin Rubber.

H. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.3 HEAT-TREATED FLOAT GLASS PRODUCTS, GENERAL

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
1. Heat-Treated Float Glass: ASTM C1048; Type I (transparent glass, flat); Quality q3 (glazing select); Kind: HS. Color and thickness as noted on Glass Types Schedule.

2.4 INSULATING GLASS PRODUCTS, GENERAL

- A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 for Class CBA units, and with other requirements indicated, including those in Glass Types Schedule.
1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
 2. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required.
 3. Dimensions of overall glass units and individual glass lites indicated in Glass Types Schedule are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- B. Sealing System:
1. Provide dual seal, with manufacturer's standard primary and secondary sealants, spacer material and construction.

2.5 WIRED GLASS PRODUCTS, GENERAL

- A. Wired Glass: ASTM 1036, Type II (patterned and wired glass, flat); Class 1 (clear); Quality q8 (glazing); of form and mesh pattern indicated in Glass Types Schedule.

REGION 1 HEADQUARTERS**2.6 MIRROR GLASS PRODUCTS, GENERAL**

- A. Fabrication Process: Float glass, with minimum 4-layer coating consisting of silver, copper, and 2 heat-cured protective coats; tested in accordance with FS DD-M-411. Fabricate in shop; avoid mechanical and chemical damage to backing.
 - 1. Seal edges immediately after fabrication with coating recommended by backing coating manufacturer.
 - 2. Wash fronts, backs, and edges with clean water immediately after fabrication.
 - 3. Always use gloves when handling mirror glass.

2.7. FIRE-PROTECTION-RATED GLAZING

- B. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 for window assemblies.

2.8 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 - 3. Colors: Provide color of exposed joint sealants to comply with the following:
 - a. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements.
- C. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.9 GLAZING TAPES

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- A. Back-Bedding Mastic Glazing Tape: 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 by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
 - 1. AAMA 806.1. As required for movement.
- B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.
- C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:
 - 1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:
 - a. PTI 303 Glazing Tape (shimless), Protective Treatments, Inc.
 - b. Tremco 440 Tape, Tremco Inc.
 - c. Extru-Seal, Pecora Corp.
 - 2. Back-Bedding Mastic Glazing Tape With Spacer Rod:
 - a. PTI 303 Glazing Tape (with shim), Protective Treatments, Inc.
 - b. Pre-shimmed Tremco 440 Tape, Tremco, Inc.
 - c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
 - 3. Expanded Cellular Glazing Tape:
 - a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.10 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.
- 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.

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- 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.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.
1. Lock-Strip Gaskets:
 - a. Stanlock Div., Griffith Rubber Mills.
 2. Preformed Gaskets:
 - a. Advanced Elastomer Systems, L.P.
 - b. Schnee-Morehead, Inc.
 - c. Tremco, Inc.

2.11 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.
- G. Mirror Hardware: Stainless Steel
1. Style: Continuous channel top and bottom.

REGION 1 HEADQUARTERS

2. Provide felt or rubber pads between glass and metal surfaces.
3. Provide fasteners, anchors, and inserts as required.

2.12 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine glass framing, with glazier present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 2. Presence and functioning of weep system.
 3. Minimum required face or edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions 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.
- C. Protect glass from edge damage during handling and installation as follows:
 1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass

REGION 1 HEADQUARTERS

with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.

2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
 - E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 - F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
 1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
 - H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
 - I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
 - J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
 - K. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.

REGION 1 HEADQUARTERS

- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Apply heel bead of elastomeric sealant.
- G. 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.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- C. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

REGION 1 HEADQUARTERS**3.7 LOCK-STRIP GASKET GLAZING**

- A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 MIRROR INSTALLATION

- A. Install mirrors in accordance with the recommendations of the mirror manufacturer and FGMA "Glazing Manual".
 - 1. Do not install having any damage to backing coating.
 - 2. Do not install until all other work in the area is complete.
 - 3. Do not install until permanent HVAC systems are in operation.
 - 4. Do not install in areas where airborne solvents or heavy duty cleaners are being used; ventilate areas thoroughly after use before installing mirrors.
 - 5. Do not install over recently installed plaster, masonry, concrete, or paint.
 - 6. Install with at least 3/16 inch space between back surface of mirror and substrate.
 - 7. Mount plumb; provide shims or spacers if required.
 - 8. Mount adjacent pieces in the same plane.

3.9 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Final Acceptance. Wash glass as recommended by glass manufacturer.

END OF SECTION 088000

SECTION 089100 - LOUVERS AND VENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Fixed, extruded-aluminum and formed-metal louvers.
- B. Related Sections:
 - 1. Division 23 Sections for louvers that are a part of mechanical equipment.

1.03 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jams and mullions, which carry it to bottom of unit and away from opening.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. (957 Pa), acting inward or outward.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with

appropriate AMCA Certified Ratings Seals.

- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
 - 3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of metal finish required.
- E. Delegated-Design Submittal: For louvers indicated to comply with structural, and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aluminum Extrusions: [ASTM B 221 \(ASTM B 221M\)](#), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: [ASTM B 209 \(ASTM B 209M\)](#), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, [G60 \(Z180\)](#) zinc coating, mill phosphatized.
- E. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use Phillips flat-head, hex-head or Phillips pan-head tamper-resistant screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
 - 4. For color-finished louvers, use fasteners with heads that match color of louvers.
- F. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6

times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.02 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or **72 inches (1830 mm)** o.c., whichever is less.
1. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
- G. Provide subsills made of same material as louvers or extended sills for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.03 FIXED, EXTRUDED-ALUMINUM LOUVERS (For Exterior Wall Openings)

- A. Horizontal, Drainable-Blade Louver:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- a. Airolite Company, LLC (The).
- b. All-Lite Architectural Products.
- c. Construction Specialties, Inc.
- d. Greenheck Fan Corporation.
- e. Nystrom Building Products.
- f. Reliable Products, Inc.
- g. Ruskin Company; Tomkins PLC.
2. Louver Depth: **4 inches (100 mm)**.
3. Frame and Blade Nominal Thickness: Not less than **0.080 inch (2.03 mm)**.

4. Mullion Type: Exposed.
5. Louver Performance Ratings: For louvers connected to mechanical ductwork confirm performance with Mechanical Requirements or:
 - a. Free Area: Not less than 50% of louver unit.
 - b. Point of Beginning Water Penetration: Not less than 900 fpm (4.6 m/s).
 - c. Air Performance: Not more than 0.15-inch wg (37-Pa) static pressure drop at 900-fpm (4.6-m/s) free-area velocity.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.04 FIXED, FORMED-METAL LOUVERS (For Hollow Metal Frame Openings, and Interior locations))

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Flow Company, Inc.
 - b. Airolite Company, LLC (The).
 - c. Construction Specialties, Inc.
 - d. Greenheck Fan Corporation.
 - e. Ruskin Company; Tomkins PLC.
2. Louver Depth: 4 inches (100 mm).
3. Frame and Blade Material and Nominal Thickness: Galvanized-steel sheet, not less than 0.052 inch (1.32 mm) for frames and 0.040 inch (1.02 mm) for blades.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
 - a. Free Area: Not less than 50% of louver unit.
 - b. Point of Beginning Water Penetration: Not less than 900 fpm (4.6 m/s)
 - c. Air Performance: Not more than 0.15-inch wg (37-Pa) static pressure drop at 900-fpm (4.6-m/s) free-area velocity.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.05 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening, except both bird and insect screening where insect screen only not recommended by Manufacturer.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.60-mm) wire.
2. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

2.06 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.07 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.04 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

- B. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089100

SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior Gypsum Wallboard.
 - 2. Gypsum Wallboard Ceilings.
 - 3. Non-load-bearing steel framing and furring.
 - 4. Tile backing panels.
- B. Related Sections include the following:
 - 1. Division 07 Section "Thermal Insulation" for insulation & vapor retarders installed in gyp board assemblies.

1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in the Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
 - 2. Provide metal framing member sizes at jambs, sills, and headers.
 - 3. Shop drawings shall be signed and sealed by a professional engineer licensed in the state of North Carolina.
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products." UL's "Fire Resistance Directory.
- B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- C. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Install mockups for the following applications:
 - a. Surfaces indicated to receive non-textured paint finishes.
 - 2. Simulate finished lighting conditions for review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

1.6 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.
- C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Gypsum Board and Related Products:
 - a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.

- c. Gold Bond Building Products Div., National Gypsum Co.
 - d. United States Gypsum Co.
- 2. Steel Framing and Furring:
 - a. Clark Steel Framing Systems.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc. - Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. MarinoWare; Division of Ware Ind.
 - f. National Gypsum Company.
 - g. Scafco Corporation.
 - h. Unimast, Inc.
 - i. Western Metal Lath & Steel Framing Systems.

2.2 STEEL PARTITION AND SOFFIT FRAMING

- A. Components, General: As follows:
 - 1. Comply with Component Sizes and Spacings: As indicated but not less than that required to comply with ASTM C 754 under the following maximum deflection and lateral loading conditions.
 - a. Maximum Deflection: L/120 at 10 lbf per sq. ft.
 - 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.
- B. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm). Or as indicated on drawings.
 - 2. Depth: As indicated.
- C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.
- D. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.
 - 1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
 - b. Metal-Lite, Inc.; Slotted Track.
- E. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - b. Metal-Lite, Inc.; The System.

- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
 - 2. Depth: 7/8 inch (22.2 mm), unless otherwise noted.
- G. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
- H. Z-Shaped Furring: With nonslotted web, face flange of 2 inches (50.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
 - 1. Comply with ASTM A 635/A 635M for exterior locations (galvanized)
- I. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36
 - 1. Regular Type:
 - a. Thickness: 5/8-inch, unless otherwise indicated.
 - b. Long Edges: Tapered and featured (rounded or beveled) for pre-filling.
 - c. Location: As indicated.
 - 2. Type X:
 - a. Thickness: 5/8" inch (15.9 mm).
 - b. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
 - c. Location: Where required for fire resistance rated assemblies.
- C. Gypsum Wallboard for damp locations (Restrooms, Mechanical Rooms, etc.): ASTM C 1278/C 1278M
 - 1. Regular Type:
 - a. Thickness: 5/8-inch, unless otherwise indicated.
 - b. Long Edges: Tapered and featured (rounded or beveled) for pre-filling.
 - c. Location: As indicated.
- D. Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board.
 - 1. Thickness: 1/2-inch (12.7 mm).
 - 2. Long Edges: Tapered.
 - 3. Location: Ceilings and soffits. Use moisture resistant as indicated.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. USG Corporation; DUROCK Cement Board.
 2. Thickness: 5/8-inch (15.9 mm).
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges. For use only at locations where tile base only is shown.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum.
 - b. CertainTeed Corp.
 - c. Georgia-Pacific Gypsum LLC.
 - d. Lafarge North America Inc.
 - e. PABCO Gypsum.
 - f. Temple-Inland.
 - g. USG Corporation.
 2. Core: 5/8 inch (15.9 mm.)

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, plastic, or paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
 - c. U-Bead: J-shaped; exposed short flange does not receive joint compound; use where indicated.
 - d. Expansion (Control) Joint: Use where indicated

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply 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:
1. Interior Gypsum Wallboard: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Pre-filling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels

1. Cementitious Backer Units: As recommended by backer unit manufacturer.
2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
 2. Acoustical Sealant for Concealed Joints:
 - a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
 - b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Non-sag, paintable, non-staining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Acoustical Sealant for Concealed Joints: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.
- E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- F. Thermal Insulation: As specified in Division 7 Section "Blanket Insulation."
- G. Polyethylene Vapor Retarder: As specified in Division 7 Section "Blanket Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and 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 gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Use deep-leg deflection track where indicated.
 - b. Use proprietary deflection track where indicated.
 - c. Use proprietary firestop track where indicated.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL 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 Masonry / Concrete walls, install foam-gasket isolation strip between studs and wall.
- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) 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 at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief. Do not fasten studs to top track to allow independent movement of studs and track.
 - 2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
 - a. Terminate partition framing at suspended ceilings where indicated.
- D. Install steel studs and furring at the following spacings:
 - 1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated or required.
 - 2. Multilayer Construction: [16 inches (406 mm) o.c., unless otherwise indicated or required.
 - 3. Cementitious Backer Units: 16 inches (406 mm) o.c., unless otherwise indicated or required.
- 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. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two studs at each jamb, unless otherwise indicated.
 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint.
- G. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- H. Z-Furring Members:
1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches (610 mm) 600 mm 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 powder-driven fasteners spaced 24 inches (600 mm) 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 of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.
- I. Polyethylene Vapor Retarder: Install to comply with requirements specified in Division 7 Section "Building Insulation."

3.5 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/2-inch- (12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
 2. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.6 PANEL APPLICATION METHODS

- A. Single-Layer Application:
 1. On ceilings, apply gypsum panels before 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 vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- D. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- E. Laminating 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 written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

F. Tile Backing Panels:

1. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
2. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
3. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Install corner beads at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed or semiexposed. 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 trims can only be installed after gypsum panels are installed.
- D. Install control joints at locations indicated, and where not indicated according to ASTM C 840, and in locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 1. Level 1: Embed tape at joints in 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 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.

3.10 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions in a manner suitable to Installer that ensures gypsum board assemblies remain without damage or deterioration at time of Final Acceptance.

END OF SECTION 092900

SECTION 093000 - CERAMIC AND PORCELAIN TILE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Glazed wall tile.
 - 3. Stone thresholds installed as part of tile installations.
 - 4. Crack isolation membrane.
 - 5. Metal edge strips installed as part of tile installations.
- B. Related Sections:
 - 1. Division 1 Section "Waste Materials Management and Recycling" for material reclamation.
 - 2. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
 - 3. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 4. Division 09 Section "Gypsum Board" for cementitious backer units and water-resistant backer board.

1.03 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Module Size: Actual tile size plus joint width indicated.
- C. Face Size: Actual tile size, excluding spacer lugs.

1.04 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- C. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.

REGION 1 HEADQUARTERS

3. Stone thresholds in 6-inch (150-mm) lengths.
 4. Metal edge strips in 6-inch (150-mm) lengths.
- D. Sustainability Submittals:
1. For adhesives and sealants, documentation including printed statement of VOC content.
 2. For adhesives and grouts, documentation including printed statement of VOC content
- E. Qualification Data: For qualified Installer.
- F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- G. Product Certificates: For each type of product, signed by product manufacturer.
- H. Material Test Reports: For each tile-setting and grouting product.

1.06 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile from one source or producer.
1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Stone thresholds.
 2. Crack isolation membrane.
 3. Metal edge strips.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Pre-installation Conference: Conduct conference at Project site.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

REGION 1 HEADQUARTERS**1.08 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS**2.01 PRODUCTS, GENERAL**

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.02 TILE PRODUCTS

- A. Manufacturers:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Daltile; Division of Dal-Tile International Inc.*
 - d. Interceramic.
 - e. Lone Star Ceramics Company.
 - f. Manufacturers approved by Architect for Substitution.

* Basis of Design
- B. Tile Type: Unglazed ceramic mosaic tile.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile "Keystones" or comparable product.
 - 2. Composition: Vitreous or impervious natural clay or porcelain.
 - 3. Module Size: 2" x 2".
 - 4. Tile Color and Pattern: Floor Finish E3A as noted on Drawings.

REGION 1 HEADQUARTERS

5. Grout Color: As selected by Architect from manufacturer's full range. Basis of Design color as noted on Drawings.
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes. Provide shapes as required for fully finished installation.
- C. Tile Type: Glazed ceramic mosaic tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Dal Tile "Color Wheel Classic" or comparable product:
 2. Composition: Vitreous or impervious natural clay or porcelain.
 3. Module Size: 6" x 6".
 4. Tile Color and Pattern: Wall Finishes W2A as noted on Drawings.
 5. Grout Color: As selected by Architect from manufacturer's full range. Basis of Design colors as noted on Drawings.
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes. Provide shapes as required for fully finished installation.
- D. Wall and Floor Tile Trim Units (General): Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
1. Base for Thin-Set Mortar Installations: Straight, module size 4-1/4 by 4-1/4 inches (108 by 108 mm). Unless otherwise shown.
 2. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 4-1/4 by 4-1/4 inches (108 by 108 mm). Unless otherwise shown.
 3. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
 4. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 5. Internal Corners: Field-buttet square corners except with coved base and cap angle pieces designed to fit with stretcher shapes

2.03 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.04 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch (1.01-mm) nominal thickness.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Compotite Corporation; Composeal Gold.

REGION 1 HEADQUARTERS

- C. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mer-Kote Products, Inc.; Fracture-Guard 5000.
 - b. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.
 - c. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.
- D. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MAPEI Corporation; Mapelastic (PRP 315).
 - b. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

2.05 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Kote Products, Inc.
 - j. Southern Grouts & Mortars, Inc.
 - k. Summitville Tiles, Inc.
 - l. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Provide prepackaged, dry-mortar mix containing dry, re-dispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
 - 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Organic Adhesive: ANSI A136.1, Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. DAP Inc.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Southern Grouts & Mortars, Inc.

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- j. Summitville Tiles, Inc.
- k. TEC; a subsidiary of H. B. Fuller Company.

C. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02

- 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type 1 (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
- 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
- 3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of the gauging water, of type specifically recommended by latex-additive manufacturer for use with field mixed Portland cement and aggregate mortar bed.

2.06 GROUT MATERIALS**A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.****B. Standard Cement Grout: ANSI A118.6.**

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.*
 - h. MAPEI Corporation.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.

* Basis of Design Color Selection.

C. Polymer-Modified Tile Grout: ANSI A118.7.

- 1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
- 2. Polymer Type: Acrylic resin or in liquid-latex form for addition to prepackaged dry-grout mix.

D. Grout for Pre-grouted Tile Sheets: Same product used in factory to pregROUT tile sheets.**E. Water-Cleanable Epoxy Grout: ANSI A118.3**

- 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F, respectively, and certified by manufacturer for intended use.

2.07 MISCELLANEOUS MATERIALS**A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.****B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.**

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- C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.08 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with adhesives bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or

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adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.03 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified for substrate and system required. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- H. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- I. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.04 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.05 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
 - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - c. Tile floors composed of rib-backed tiles.
- B. Joint Widths: Install tile on floors with the following joint widths:

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1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm)
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated:
 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- E. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with a soft cloth.

3.06 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths
 1. Glazed Wall Tile: 1/16 inch (1.6 mm).

3.07 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 3. Clean water before and after cleaning.
 4. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.08 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 1. Dry Area Floors () : Thin Set Tile Installation TCNA F113 at interior slab on grade construction. TCNA F125 at concrete floors with cracks using crack isolation membrane:
 - a. Tile Type: Unglazed Ceramic Mosaic Tile.
 - b. Thin-Set Mortar: Latex Portland Cement Mortar.
 - c. Grout: Polymer-modified sanded grout.

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2. Wet Area Floors (): Thin Set Tile Installation TCNA F122 using epoxy grout at wet area interior slab on grade construction. Use TCNA F125 at wet area floors with cracks using waterproofing and crack isolation membrane. Install epoxy grout in accordance with TCNA F115.
 - a. Tile Type: Unglazed Ceramic Mosaic Tile.
 - b. Thin-Set Mortar: Latex Portland Cement Mortar.
 - c. Grout: Water-Cleanable Epoxy Grout.
 3. Mortar Bed Set (Shower Receptors): Thick-set Tile Installation TCNA B420 with interior depressed slab on grade construction. Coordinate with shower wall installation method used. Install tile using TCNA Method for substrate condition and type for mortar bed setting and substrate condition as follows.
 - a. Tile Type: Unglazed Ceramic Mosaic Tile
 - b. Thin-Set Mortar: Latex Portland Cement Mortar
 - c. Grout: Water-Cleanable Epoxy Grout
 - d. Provide waterproofing membrane
- B. Interior Wall Installations, Metal Studs or Furring:
1. Dry Area Walls (): TCNA W243 typical dry area walls.
 - a. Tile Type: Glazed wall tiles.
 - b. Thin-Set Mortar: Latex Portland Cement Mortar.
 - c. Grout: Polymer-modified sanded grout.
 2. Wet Area Walls (Shower Rooms, Mudroom Vestibules base, Gang Toilet Rooms, Mop Sink Rooms): TCNA W244 thin-set mortar on cementitious backer units.
 - a. Tile Type: Glazed wall tiles.
 - b. Thin-Set Mortar: Latex Portland Cement Mortar
 - c. Grout: Water-Cleanable Epoxy Grout.
 - d. Provide waterproofing membrane throughout shower room.

END OF SECTION 093000

SECTION 095113 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**. Comply with requirements in Division 01 Section "Project Management and Coordination".

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For components with factory-applied finishes.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of **6-inch- (150-mm-) square** Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of **6-inch- (150-mm-) long** Samples of each type, finish, and color.
 - 3. Clips: Full-size clips.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Size and location of initial access modules for acoustical panels.

6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
8. Minimum Drawing Scale: **1/4 inch = 1 foot (1:48)**.

B. Qualification Data: For testing agency.

- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, **from ICC-ES**.
- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Units: Full-size panels equal to **2 percent** of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to **2 percent** of quantity installed.
 3. Hold-Down and Impact Clips: Equal to **2 percent** of quantity installed.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockup of typical ceiling area as shown on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packaging and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, 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 system components carefully to avoid chipping edges, scratching, or damaging units in any way.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type of acoustical ceiling panel from single source from single manufacturer.
 - 2. Supporting Suspension System: Obtain each type of supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to CISCA recommendations. Comply with CISCA publication: "Seismic Construction Handbook" for CISCA Zones 0-2.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **Class A** according to ASTM E1264.
 - 2. Smoke-Developed Index: **50** or less.

2.3 ACOUSTICAL PANELS [TYPICAL]

- A. Drawing Designation:
 - 1. Reflected Ceiling Plan Label: **ACT | 2x2**.

- B. Manufacturers: Subject to compliance with requirements, provide product comparable to Basis-of-Design selection by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Architectural
 - 3. USG Interiors, LLC
- C. Basis-of-Design Product:
 - 1. Armstrong Ultima High NRC Beveled Tegalur 24"x24" (1941)
- D. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- E. Classification: Provide panels as follows:
 - 1. Type and Form: **Type IV**, mineral base with membrane-faced overlay; **Form 2**, water felted.
 - 2. Pattern: **E** (lightly textured).
- F. Color: White.
- G. Light Reflectance (LR): Not less than **0.85**.
- H. Ceiling Attenuation Class (CAC): Not less than **35**.
- I. Noise Reduction Coefficient (NRC): Not less than **0.80**.
- J. Articulation Class (AC): Not less than **170**.
- K. Edge/Joint Detail: Beveled Tegalur.
- L. Thickness: **7/8 inch (22 mm)**.
- M. Modular Size: **24 by 24 inches (610 by 610 mm)**.
- N. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial fungicide formulation.

2.4 ACOUSTICAL PANELS [WET AREAS]

- A. Drawing Designation:
 - 1. Reflected Ceiling Plan Label: ACT-MR | 2x2.
- B. Manufacturers: Subject to compliance with requirements, provide product comparable to Basis-of-Design selection by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Architectural
 - 3. USG Interiors, LLC
- C. Basis-of-Design Product:

1. Armstrong Ultima Health Zone High NRC Beveled Tegular 24"x24" (1447)
- D. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- E. Classification: Provide panels as follows:
 1. Type and Form: **Type IV**, mineral base with membrane-faced overlay; **Form 2**, water felted.
 2. Pattern: **E** (lightly textured).
- F. Color: White.
- G. Light Reflectance (LR): Not less than **0.85**.
- H. Ceiling Attenuation Class (CAC): Not less than **35**.
- I. Noise Reduction Coefficient (NRC): Not less than **0.80**.
- J. Articulation Class (AC): Not less than **170**.
- K. Edge/Joint Detail: Beveled Tegular.
- L. Thickness: **7/8 inch (22 mm)**.
- M. Modular Size: **24 by 24 inches (610 by 610 mm)**.
- N. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.
- O. Surface: Water-repellent, washable, scrubable.

2.5 METAL SUSPENSION SYSTEM [GENERAL]

- A. Manufacturers: Subject to compliance with requirements, provide product comparable to Basis-of-Design selection by one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed Architectural
 3. USG Interiors, LLC
- B. Basis-of-Design Product:
 1. Armstrong Prelude XL.
- C. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.

- D. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized, **G30 (Z90)** coating designation; with prefinished **15/16-inch- (24-mm-)** wide metal caps on flanges.
1. Structural Classification: **Intermediate-duty** system.
 2. End Condition of Cross Runners: **Override (stepped)** type.
 3. Face Design: **Flat, flush**.
 4. Cap Material: **Cold-rolled steel or Aluminum**.
 5. Cap Finish: Baked polyester paint or powder coated: **White**.

2.6 ACCESSORIES [GENERAL]

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **10** times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than **0.106-inch- (2.69-mm-)** diameter wire.
- C. Hold-Down Clips: Manufacturer's standard hold-down.
- D. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- E. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.7 METAL EDGE MOLDINGS AND TRIM [GENERAL]

- A. Manufacturers: Subject to compliance with requirements, provide product by same manufacturer selected for Metal Suspension System.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Molding profile: Shadow Molding.

2. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
3. 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.
4. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Lay out openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, Ceilings & Interior Systems Construction Association (CISCA) recommendations, manufacturer's written instructions, and seismic design requirements outlined in NCBC 2018 Chapter 16 requirements, and.
- 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. 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.

4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- 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. Miter corners accurately and connect securely.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- 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 fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 3. Install hold-downclips in areas indicated and where units weight less than 1psf; space according to panel manufacturer's written instructions unless otherwise indicated.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**, non-cumulative.

3.5 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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Resilient base.
- B. Related Sections:
 - 1. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Resilient Base and Accessories: Obtain each type and color of base from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 - 2. Smoke Density: Less than 450, as rated by ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Store tiles on flat surfaces. Move base and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Final Acceptance, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE (FINISH SCHEDULE DESIGNATION: B1)

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allstate Rubber Corp.; Stoler Industries.
 - b. Armstrong World Industries, Inc.
 - c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - d. Endura Rubber Flooring; Division of Burke Industries, Inc.
 - e. Estrie Products International; American Biltrite (Canada) Ltd.
 - f. Flexco, Inc.
 - g. Johnsonite.
 - h. Mondo Rubber International, Inc.
 - i. Musson, R. C. Rubber Co.
 - j. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
 - k. PRF USA, Inc.
 - l. Roppe Corporation, USA. (Basis of Design)
 - m. VPI, LLC; Floor Products Division.

- B. Resilient Base Standard: ASTM F 1861.
 - 1. Manufacturing Method: Group I (solid, homogeneous).
 - 2. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: 48 inches (1219 mm) long or coils in manufacturer's standard length.
- F. Colors and Patterns: As indicated on Finish Schedule.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 1. Do not stretch resilient base during installation
- E. Job-Formed Corners:
 1. Install corners before installing straight pieces.
 2. Outside Corners:
 - a. Use straight pieces of maximum lengths possible.
 - b. Shave back of base at point where bending will occur. Remove a strip perpendicular to length of base, deep enough to produce snug fit without producing discoloration (whitening) at bends or removal of more than half the thickness of the wall base.
 3. Inside Corners:
 - a. Use straight pieces of maximum lengths possible.
 - b. Cut inverted V-shaped notch in toe of wall base at the point where the corner is formed. Shave back of base where required for snug fit to substrate.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Clean base using method recommended by manufacturer not more than 4 days prior to dates scheduled for inspections intended to establish date of Final Acceptance in each area of Project.

END OF SECTION 095113

SECTION 096519 - VINYL PLANK AND TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Solid vinyl plank flooring.
- B. Related Requirements:
 - 1. Section 096513 "Resilient Base and Accessories" for base and accessories installed with floor.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of plank or tile.
 - 1. Include floor layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
- C. Samples for Initial Selection:
 - 1. Provide Manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of flooring indicated.
- D. Samples for Verification: Full-size units of each color and pattern of floor tile required, showing full range of expected variation in characteristics.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 WARRANTY

- A. Manufacturer's standard warranty:
 - 1. Warranty Period: 15 years from date of Final Acceptance.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Plank Flooring: Furnish not less than one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an experienced installer who is certified by the International Certified Flooring Installers Association or Flooring Contractors Association for installation techniques required, or who can demonstrate compliance with its certification program requirements.
 - 2. Experience on at least five projects of comparable size, type, and complexity as specified Project.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - a. For each type, color, and pattern in sizes and locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.10 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 90 deg F (32 deg C), in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. After installation and until Final Acceptance, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during flooring installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Do not install flooring until wet work in spaces is complete and dry and ambient humidity conditions are maintained at the levels indicated for Project when occupied for its intended use
- F. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include, but are not limited to, the following:
 - 1. Armstrong Flooring, Inc.
 - 2. Interface, Inc.
 - 3. Mannington Commercial.
 - 4. MILLIKEN.
 - 5. Roppe Corporation.
 - 6. Tarkett.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 SOLID VINYL PLANK FLOORING

- A. Tile Standard: ASTM F1700.
 - 1. Class: Class III, Printed Film Vinyl Tile.
 - 2. Type: B, Embossed Surface.
- B. Thickness:
 - 1. Overall: Not less thtn 0.120 inch (3.0 mm).
 - 2. Wear Layer: Not less than 28 mil (0.70mm).
- C. Format: Plank.
- D. Colors and Patterns: As selected by Architect from Manufacturer's full range.
- E. Performance Requirements:
 - 1. ASTM D2047 Static Coefficient of Friction: > 0.50.

2. ASTM F970 Static Load Limit: 250 psi, Pass.
3. ASTM F970 (Modified), Max Load Limit: 2,000 psi.
4. ASTM F2199 Dimensional Stability: Pass.
5. ASTM F1914 Residual Indentation: Pass.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Level substrate within to floor covering manufacturers requirements noncumulative, in all directions. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis unless indicated otherwise.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.

REGION 1 HEADQUARTERS

- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Where polish is recommended by flooring manufacturer, remove soil, adhesive, and blemishes from floor tile surfaces before applying recommended number of coats of liquid floor polish.
- E. Cover floor tile until Substantial Completion.
- F. Do not move heavy or sharp objects directly over tiles.
- G. Do not allow traffic for 24 hours after installation. Do not allow rolling load traffic or placement of fixtures or furnishings for at least 72 hours after installation.

END OF SECTION 096519

SECTION 096810 - CARPET TILE

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. Modular Tufted carpet tile.
- B. Related Sections include the following:
 - 1. Division 1 Sections "Environmental Impact of Materials" for additional requirements.
 - 2. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pile direction.
 - 7. Type, color, and location of insets and borders.
 - 8. Type, color, and location of edge, transition, and other accessory strips.
 - 9. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Samples for initial selection purposes in form of manufacturer's typical tile samples, including backing, consisting of actual tiles or section of tiles showing manufacturer's full range of colors and patterns available.
 - a. Sample sizes for initial selection: not less than 4 1/2" x 4 1/2".
 - 2. Samples for verification purposes in full-size tiles of each different color and pattern of carpet tile indicated through initial selection process.

- 3. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) square samples.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- E. Sustainability Submittals, comply with and submit:
 - 1. Manufacturers' product data for carpet tile and installation adhesive, including printed statement of VOC content.
 - 2. Waste Management Plan.
- F. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.
- G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."
- D. Mockups: Before installing carpet, install mockups for each type of carpet installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be installed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Approved mockups may become part of the completed Work if undamaged at time of Final Acceptance.
- E. Single Source Responsibility: Provide material produced by a single manufacturer for each carpet type.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.
- D. Sequence carpet installation with other work to minimize possibility of damage or soiling during remainder of construction.

1.7 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. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: 15 years from date of Final Acceptance.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet: 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).
 - 2. Deliver stock of maintenance materials from same manufacturer lot as materials installed and enclosed in protective packaging with appropriate identifying labels. Scraps are not to be considered maintenance/extra stock materials. The Owner reserves the right, and must be notified of, and allowed to salvage all scrap material deemed usable, prior to disposal. Coordinate with Owner as required.

PART 2 - PRODUCTS

2.1 CARPET

- A. As Shown on Drawing Sheet A1-801-Finishes and A2-801-Finishes:
 - 1. Floor Finish F2A
 - a. Basis of Design: Interface.
 - b. Color: 103985 "Steel".
 - c. Style: Common Theme.
 - d. Pattern: Common Theme.

2. Floor Finish F2B
 - a. Basis of Design: Interface.
 - b. Color: 106049 "Pedrusco".
 - c. Style: Viva Colores.
 - d. Pattern: Viva Colores.
3. Other Acceptable Manufacturers for Floor Finish F2A and F2B:
 - a. Milliken Carpet
 - b. The Mowhawk Group-Bigelow Division
 - c. C & Commercial
 - d. Shaw Industries
- B. Fiber Content: Duracolor, Mohawk Stain Resistant System, Passing Requirements for Permanent Stain Resistant Carpet.
- C. Nylon Type: Duracolor Premium Nylon.
- D. Construction: Tufted.
- E. Surface Texture: Textured Patterned Loop.
- F. Gauge: 1/12 inch (mm).
- G. Stitches: 11.2 stitches per inch (mm).
- H. Pile Thickness: 0.104 inches.
- I. Pile Density: 6,923.
- J. Face Weight: 20 oz./sq. yd. for finished carpet.
- K. Backing System: EcoFlex NXT.
- L. Width: 24" x 24" (0.6096 m x 0.6096 m)
- M. Protective Treatment: Sentry Soil Protection
- N. Performance Characteristics: As follows:
 1. Static: AATCC-134 Under 3.5 KV
 2. Flammability: ASTM E 648 Class 1
 3. Smoke Density: ASTM E 662 Less than 450.
- N. Recycled Content Material: Pre-Consumer 56%.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:
 1. Carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the following:

1. Carpet manufacturer and in compliance with Division 1 "Sustainable Design Requirements"
- C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following:
 1. Carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Carpet with Pre-Applied Adhesive Installation: Comply with CRI 104, Section 10.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
- B. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Level adjoining border edges.
- C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- F. Install pattern parallel to walls and borders.
- G. Install carpet edge guard where edge of carpet is exposed; anchor guards to substrate.
- H. Do not bridge building expansion joints with continuous carpeting. Provide for movement.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 096810

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
- B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
 - 1. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
 - 1. Prefinished items not to be painted include the following factory-finished components:
 - a. Phenolic toilet enclosures.
 - b. Acoustic materials.
 - c. Architectural woodwork and casework.
 - d. Finished mechanical and electrical equipment, except where noted.
 - e. Light fixtures.
 - f. Switchgear.
 - g. Distribution cabinets.
 - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Pipe spaces.
 - 3. Finished metal surfaces not to be painted include:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper
 - e. Bronze.

4. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 5. Operating parts not to be painted include moving parts of operating equipment, such as the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 05 Section "Metal Fabrications" for shop-priming ferrous metal.
 2. Division 06 Section "Interior Architectural Woodwork" for shop-priming interior architectural woodwork.
 3. Division 08 Section "Hollow Metal Doors and Frames" for shop-priming steel doors and frames.
 4. Division 09 Section "High Performance Coatings" for painting exterior metals.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 01 Sections.
- B. Product data for each paint system specified, including block fillers and primers.
1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
 2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- C. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
 3. Submit samples on the following substrates for the Architect's review of color and texture only:
 - a. Concrete Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.
 - b. Painted Wood: Provide two 12-inch-square samples of each color and material on hardboard.
 - c. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural and stained wood finish on actual wood surfaces.
 - d. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

1.4 QUALITY ASSURANCE

- A. **Applicator Qualifications:** Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. **Single-Source Responsibility:** Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- C. **Field Samples:** On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
 - 1. Final acceptance of colors will be from job-applied samples.
 - 2. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.
 - a. After finishes are accepted, this room or surface will be used to evaluate coating systems of a similar nature.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, the following:
 1. Duron Paint Co. (Duron)
 2. ICI Paint Stores (ICI).
 3. The Sherwin-Williams Company (S-W).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide color selections made by the Architect from the manufacturer's full range of standard colors. Refer to Paint Schedule at end of these specifications and Finish Schedule in drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
 - 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
 - 4. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
 - a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 3. Use only thinners approved by the paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Provide finish coats that are compatible with primers used.
 3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 7. Paint interior surfaces of ducts, where visible through grilles, with flat, nonspecular black paint.
 8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
 11. Sand lightly between each succeeding enamel or varnish coat.
 12. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
 - 1. Brushes: Use brushes best suited for the material applied.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate with total dry film thickness of the entire system as recommended by the manufacturer.
- F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
- G. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Supports.
 - 2. Motors and mechanical equipment.
 - 3. Accessory items.
- H. Electrical items to be painted include, but are not limited to, the following:
 - 1. Switchgear.
- I. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- J. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- L. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- M. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats.

- N. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates indicated.
- B. Zinc-Coated Metal (Exterior Hollow Metal Door Frames and Mechanical Equipment):
 - 1. Semi-gloss Acrylic Enamel Finish: 2 finish coats over galvanized metal primer.
 - a. Galvanized metal primer at dry film thickness minimum of 1.2 mils
 - 1) Duron: Dura Clad Acrylic Galvanized Metal Primer 33-404
 - 2) ICI: Devflex 4020 DTM Flat Interior/Exterior Waterborne Primer
 - 3) S-W: Galvite HS
 - b. First and Second Coats: Semigloss, exterior acrylic latex-enamel at total dry film thickness of not less than 2.6 mils
 - 1) Duron: Weathershield Acrylic Enamel Semi-Gloss
 - 2) ICI: Decra-Shield Exterior 100% Acrylic Semi-Gloss Finish
 - 3) S-W: A-100 Exterior Latex Gloss
- C. Ferrous Metal:
 - 1. Semigloss Acrylic Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Rust-inhibitive metal primer at dry film thickness of 1.3 mils. Color: Grey
 - 1) Duron: Duraclad Universal Acrylic Metal Primer 33-900
 - 2) ICI: Devflex 4020 DTM Flat Interior/Exterior Waterborne Primer
 - 3) S-W: Kem Kromick Universal Metal Primer
 - b. First and Second Coats: Semigloss, exterior acrylic latex-enamel at total dry film thickness of not less than 2.6 mils

- 1) Duron: Weathershield Acrylic Enamel Semi-Gloss
- 2) ICI: Decra-Shield Exterior 100% Acrylic Semi-Gloss Finish
- 3) S-W: DTM Acrylic Semi Gloss

3.7 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Gypsum Drywall Systems:

1. Eggshell Acrylic Enamel Finish: Three coats with total thickness min. 3.5 mils.
 - a. Location: All gypsum drywall wall surfaces, including vertical surfaces of soffits.
 - b. Sheen: Sheen shall be no lower than 25% light reflectance.
 - c. Primer: Tint to match, interior, latex-based primer at min thickness of 1.0 mils, with VOC content no higher than 0.01 pounds/gallon.
 - 1) Duron: Genesis Odor-Free Primer
 - 2) ICI: Lifemaster 2000 Interior Wall Primer
 - 3) S-W: Health Spec Low Odor Interior Latex Primer
 - d. First and Second Coats: Low-luster acrylic-latex enamel min thickness of 2.5 mils, with VOC content no higher than 0.01 pounds/gallon.
 - 1) Duron: Genesis Odor-Free Interior Latex Low Sheen Enamel
 - 2) ICI: Lifemaster 2000 Interior Eggshell Finish
 - 3) S-W: Health Spec Low Odor Interior Latex Eg-shel
2. Lusterless (Flat) Emulsion Finish: Two coats.
 - a. Location: All drywall ceilings and horizontal soffit surfaces
 - b. Primer: Tint to match, interior, latex-based primer at min thickness of 1.0 mils, with VOC content no higher than 0.01 pounds/gallon.
 - 1) Duron: Genesis Odor-Free Primer
 - 2) ICI: Ultra-Wall Latex Flat Interior Wall Paint
 - 3) S-W: Health Spec Low Odor Interior Latex Primer
 - c. Finish Coat: Interior, flat, latex-based paint.
 - 1) Duron: Genesis Odor-Free Interior Latex Flat Emulsion
 - 2) ICI: Ultra-Wall Latex Flat Interior Wall Paint
 - 3) S-W: Health Spec Low Odor Interior Latex Flat

C. Natural Finish Woodwork:

1. Waterborne Satin - Varnish Finish: 2 coats of waterborne clear-satin varnish over a sanding sealer. Wipe wood filler before applying stain.
 - a. Filler Coat: Paste-wood filler applied at rate recommended by the manufacturer.
 - 1) Devoe: None required
 - 2) Moore: Benwood Paste Filler #238
 - 3) P&L: None required

- b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by manufacturer.
 - 1) Devoe: 4200 WoodWorks Waterborne Quick-Dry Clear Sealer
 - 2) Moore: None Recommended.
 - 3) P&L: Z 7520 Latex Sanding Sealer
 - c. First and Second Coats: Waterborne, varnish finish applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 4300 WoodWorks Waterborne Crystal Clear Finish, Satin
 - 2) Moore: Stays Clear Acrylic Polyurethane #423, Satin
 - 3) P&L: Z 17 Acrylic Latex Varnish, Stain
- D. Stained Woodwork:
- 1. Waterborne Satin - Varnish Finish: 2 coats of waterborne clear-satin varnish over a sealer coat and a waterborne, interior wood stain. Wipe wood filler before applying stain.
 - a. Filler Coat: Paste-wood filler applied at rate recommended by the manufacturer.
 - 1) Devoe: None required
 - 2) Moore: Benwood Paste Filler #238
 - 3) P&L: None required
 - b. Stain Coat: Waterborne interior wood stain at spreading rate recommended by manufacturer.
 - 1) Devoe: 41XX WoodWorks Waterborne Interior Stain
 - 2) Moore: Benwood Penetrating Interior Stain #234
 - 3) P&L: Z 197 Acrylic Latex Stain Interior
 - c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by manufacturer.
 - 1) Devoe: 4900 WoodWorks Quick-Dry Clear Sealer
 - 2) Moore: None recommended
 - 3) P&L: Z 7520 Latex Sanding Sealer
 - d. First and Second Coats: Waterborne varnish finish, applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 4300 WoodWorks Waterborne Crystal Clear Finish, Satin
 - 2) Moore: Stays Clear Acrylic Polyurethane #423, Satin
 - 3) P&L: Z 17 Acrylic Latex Varnish, Stain
- E. Zinc-Coated Metal (Interior Hollow Metal Doors & Frames):
- 1. Semi-gloss Acrylic Enamel Finish: Two coats over primer, with total dry film thickness not less than 4.0 mils, and VOC content no higher than 1.2 pounds/gallon.
 - a. Primer: Galvanized metal primer.
 - 1) Duron: Duraclad Acrylic Galvanized Metal Primer 33-404
 - 2) ICI: Devflex 4020 DTM Flat Interior/Exterior Waterborne Primer
 - 3) S-W: DTM Acrylic Primer / Finish
 - b. First and Second Coats: Semi-gloss acrylic-latex enamel min thickness of 2.5 mils, with VOC content no higher than 0.01 pounds/gallon.

- 1) Duron: Genesis Odor-Free Interior Latex Semi-Gloss Enamel
- 2) ICI: Lifemaster 2000 Interior Semi-Gloss Finish
- 3) S-W: Health Spec Low Odor Interior Latex Semi-Gloss

F. Ferrous Metal:

- 1. Semigloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.

- a. Primer: Galvanized metal primer.

- 1) Duron: Duraclad Universal Acrylic Metal Primer 33-105
 - 2) ICI: 6970 Lifemaster Pro
 - 3) S-W: DTM Acrylic Primer / Finish

- b. First and Second Coats: Semi-gloss acrylic-latex enamel min thickness of 2.5 mils, with VOC content no higher than 0.01 pounds/gallon.

- 1) Duron: Genesis Odor-Free Interior Latex Semi-Gloss Enamel
 - 2) ICI: Lifemaster 2000 Interior Semi-Gloss Finish
 - 3) S-W: Health Spec Low Odor Interior Latex Semi-Gloss

END OF SECTION 099100

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Steel.
 - b. Galvanized metal.
- B. Related Requirements:
 - 1. Division 09 Section "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 09 Section "Concrete Coatings" for exterior vertical concrete surfaces.
 - 3. Division 09 Section "Painting" for special-use coatings and general field painting.

1.03 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 - 3. VOC content.

1.05 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under

sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Behr Process Corporation.
 2. Benjamin Moore & Co.
 3. Bennette Paint Mfg. Co., Inc.
 4. Betonel Ltd.
 5. BLP Mobile Paint Manufacturing Company, Inc.
 6. Cloverdale Paint.
 7. Color Wheel Paints & Coatings.
 8. Columbia Paint & Coatings.
 9. Conco Paints.
 10. Coronado Paint.
 11. Diamond Vogel Paints.
 12. Dunn-Edwards Corporation.
 13. Duron, Inc.

14. Euclid Chemical Company.
15. Farrell-Calhoun.
16. Frazee Paint.
17. General Paint.
18. Hirshfield's, Inc.
19. ICI Paints.
20. Insl-x.
21. Kelly-Moore Paints.
22. Kwal Paint.
23. M.A.B. Paints.
24. Microblend Technologies Inc.
25. Miller Paint.
26. Mills Paint.
27. PARA Paints.
28. Parex LaHabra Inc.
29. Parker Paint Mfg. Co. Inc.
30. PPG Architectural Finishes, Inc.
31. Pratt & Lambert.
32. Rodda Paint Co.
33. Scott Paint.
34. Sherwin-Williams Company (The).
35. Sico, Inc.
36. Vista Paint.
37. Zinsser.

2.02 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Material Compatibility:
 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 3. Provide products of same manufacturer for each coat in a coating system.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior coatings applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 6. Pre-Treatment Wash Primers: 420 g/L.
 7. Floor Coatings: 100 g/L.
 8. Shellacs, Clear: 730 g/L.
 9. Shellacs, Pigmented: 550 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.

2.03 METAL PRIMERS

- A. Primer, Zinc-Rich, Inorganic: MPI #19.

- B. Primer, Zinc-Rich, Epoxy: MPI #20.
- C. Primer, Rust-Inhibitive, Water Based: MPI #107.
- D. Primer, Epoxy, Anti-Corrosive, for Metal: MPI #101.
- E. Primer, Vinyl Wash: MPI #80.

2.04 EPOXY COATINGS

- A. Epoxy, Gloss: MPI #77.
- B. Epoxy, High-Build, Low Gloss: MPI #108.

2.05 POLYURETHANE COATINGS

- A. Polyurethane, Two-Component, Pigmented, Gloss (Gloss Level 6): MPI #72.

2.06 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.03 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing,

scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 099600

REGION 1 HEADQUARTERS**SECTION 10100 - VISUAL DISPLAY 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 the following types of visual display boards:
 - 1. Porcelain Markerboards (for liquid chalk).
 - 2. Fabric Tack Boards.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 6 Section "Miscellaneous Carpentry" for wood blocking and grounds.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Include individual panel weights for markerboard units.
- C. Shop Drawings: Provide shop drawings for each type of markerboard required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- D. Samples: Provide the following samples of each product for initial selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture:
 - a. Porcelain Enamel Markerboard: Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of chalkboard and markerboard required.
 - b. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.
 - 2. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated.

REGION 1 HEADQUARTERS

- a. Markerboards: Sample panels not less than 8-1/2 inches by 11 inches for each type of markerboard indicated. Include a sample panel for each color, texture, and pattern required.
- b. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sets showing the full range of variations expected.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the chalkboard manufacturer for both installation and maintenance of the type of sliding chalkboard units required for this Project.
- B. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the specific type and model indicated. Other visual display boards having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

1.6 WARRANTY

- A. Porcelain Enamel Wipe-off Markerboard: Furnish the manufacturer's written warranty, agreeing to furnish new markerboards should original boards not retain their original writing and erasing qualities, under normal classroom usage, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed, without reducing or otherwise limiting any other rights to correction which the Owner may have under contract documents.
 1. Warranty Period: 20 years.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 1. Porcelain Marker Boards and Fabric Tack Boards:
 - a. AJW Architectural Products.
 - b. ASI Visual Display Products.
 - c. Claridge.

REGION 1 HEADQUARTERS

- B. Porcelain Marker Boards
 - a. Type: Fixed Marker Board Unit.
 - b. Material: Porcelain Enamel.
 - c. Size: 4'-0" x 6'-0".
 - d. Configuration: Fixed Unit.
 - e. Panel Finish: Standard Gloss Finish – White.
 - f. Trim Finish: Clear Anodized Aluminum.
 - g. Tray Finish: Clear Anodized Aluminum.
 - h. Mounting: Direct to Wall – Coordinate Required Blocking.
 - i. Locations: As Indicated on Drawings. Field Coordinate Final Location with Owner/Architect.
- C. Tack Boards
 - a. Type: Fixed Marker Board Unit.
 - b. Material: Fabric.
 - c. Size: 4'-0" x 6'-0".
 - d. Configuration: Fixed Unit.
 - e. Panel Finish: Color Selected from Manufacturer's Full Range.
 - f. Trim Finish: Clear Anodized Aluminum.
 - g. Tray Finish: Clear Anodized Aluminum.
 - h. Mounting: Direct to Wall – Coordinate Required Blocking.
 - i. Locations: As Indicated on Drawings. Field Coordinate Final Location with Owner/Architect.

2.2 MATERIALS

- A. Porcelain Enamel Markerboards: Provide balanced, high-pressure-laminated porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.
 - 1. Face Sheet: Provide face sheet of 24-gage enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1200 deg F (649 deg C).
 - a. Cover Coat: (Markerboard Surfaces) Provide the manufacturer's standard light-colored special writing surface with gloss finish intended for use with liquid felt-tipped markers.
 - 2. Core: Provide the manufacturer's standard 3/8-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.
 - 3. Backing Sheet: Provide the manufacturer's standard 0.015-inch-thick aluminum sheet backing.
 - 4. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.

2.3 ACCESSORIES

REGION 1 HEADQUARTERS

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
 - 1. Where the size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.
 - 2. Marker Tray: Furnish the manufacturer's standard continuous, solid extrusion-type aluminum chalktray with ribbed section and smoothly curved exposed ends, for each markerboard.

2.4 FABRICATION

- A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- B. Assembly: Provide factory-assembled markerboard units.
 - 1. Fabricate each board from a single panel of material. Panel joints will not be permitted.

2.5 FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Baked Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - 1. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils, medium gloss.
 - 2. Color: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Deliver factory-built markerboard units completely assembled in one piece without joints.
- B. Install markerboard units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

REGION 1 HEADQUARTERS

3.2 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions. Break in chalkboards only as recommended by the manufacturer.

END OF SECTION 10100

SECTION 101400 – SIGNAGE

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. Exterior and Interior Panel signs.
 - 2. Dimensional lettered exterior signs.
 - 3. Signage accessories.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for temporary project identification signs.
 - 2. Division 26 Section "Interior Lighting" for illuminated exit signs.
 - 3. Division 26 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
 - 4. Division 31 Section "Site Clearing" for temporary protection-zone signage.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
 - 2. Provide floor plans showing signage room numbers and plan location of signs.
- C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.
- D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.
 - 3. Approved samples will be returned for installation into Project.

- E. Qualification Data: For Installer.
- F. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with the North Carolina Accessibility Code 2009, ANSI A117.1-2009, Americans with Disabilities Act (ADA), and with code provisions as adopted by authorities having jurisdiction.
 - 1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
 - a. Illuminated Exit Signs
 - b. Fire Doors
 - c. Room Capacity
 - d. Stairway Identification
- 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.
- E. Permanent Signage/Stenciling Identification of Rated Wall Assemblies with Protected Openings (Above Ceiling).

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
 - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in material or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:

- a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.3 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.
- B. Basis-of-Design Product: {ASI Sign Systems; Emboss, with raised lettering and braille} or a comparable product of one of the following available Manufacturers:
 1. Allenite Signs; Allen Marking Products, Inc.
 2. American Graphics Inc.
 3. Andco Industries Corp.
 4. APCO Graphics, Inc.
 5. ASI Sign Systems, Inc.
 6. Best Manufacturing Co.
 7. Grimco, Inc.
 8. Innerface Sign Systems, Inc.
 9. Kaltech Industries Group, Inc.
 10. Mills Manufacturing, Inc.
 11. Mohawk Sign Systems.
 12. Seton Identification Products.
 13. Signature Signs, Inc.
 14. Supersine Company (The).

- C. 1. Sign Materials Materials" Panel signs to be 1/8" subsurface painted photopolymer signs with surface raised copy and grade 2 braille.
- D. Fabrication
 - 1. Tactile Graphics and Text:
 - a. Signage font: Signage Font: As Indicated on Drawings.
 - a. Fabrication process: Provide tactile copy[and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's vacuum formed embossing process.
 - b. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
 - 2. Mounting Panel:
 - a. 0.080 inch thick matte finished acrylic.
 - 3. Background Appearance:
 - a. Solid color: Select from manufacturer's standard range.
 - b. Subsurface custom graphics: On sign type "A" provide single color graphic (i.e. department seal) to be selected by owner/architect of contrasting color to background.
 - 4. Tactile Lettering and Graphics Color Options: Select from 3M standard vinyl colors.
 - 5. Overall panel size: Per Drawings.
 - 6. Shape: Rectangular (per Drawings).
 - 7. Letter style[s], color[s], letter size[s] and layout position: Per Drawings.
- C. Cast-Acrylic Sheet: Manufacturer's standard and as follows:
 - 1. Color: As selected by Architect from manufacturer's full range.
- D. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
 - 1. Edge Condition: Square cut.
 - 2. Corner Condition: Square.
- E. Laminated Panels: Permanently laminate face panels to backing sheets of material; use manufacturer's standard process.
- F. Graphic Content and Style: Provide sign copy that complies with requirements indicated on Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
- G. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with "Accessibility Guidelines for Buildings and Facilities (ADAAG)." Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 - 1. Panel Material: Opaque acrylic sheet.
 - 2. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).
- H. Applied Copy: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing. Apply copy to exposed face of panel sign.
 - 1. Panel Material: Opaque acrylic sheet.

REGION 1 HEADQUARTERS

- I. Colored Coatings for Acrylic Sheet: For copy and background colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

2.4 DIMENSIONAL LETTERS AND CAST FORMS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.
- B. Manufacturers: Provide products by one of the following manufacturers, or other approved equal:
 1. Andco Industries Corp
 2. ASI Sign Systems, Inc.
 3. The Supersine Company
- C. Letterforms and Logo Forms: Produce characters and logo with smooth, flat faces, and precisely formed lines and profiles, free from pits and other defects. Signage to be fabricated to receive concealed 1/4" aluminum threaded rods. Comply with requirements for finish, style and size.
 1. Material: PVC.
 2. Letter Style: As Indicated on Drawings.
 3. Letter Height: As Indicated on Drawings.
 4. Letter Depth: As Indicated on Drawings.
 5. Color: As selected by Architect from Manufacturer's Full List of Colors

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- B. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- C. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.6 ACCESSORIES

- A. Mounting Methods: Use concealed fasteners where substrate permits, silicone adhesive when mounting to glass fabricated from materials that are not corrosive to sign material and mounting surface.

2.7 FINISHES, GENERAL

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.
- E. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
- F. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.
 - 1) Color: As selected by the Architect from the manufacturer's standard colors

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
 - 1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
 - 2. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
 - 3. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.
- C. Bracket-Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4 SIGN SCHEDULE

- 1. Signage Schedule is included on Drawing Sheets A1-701 and A2-701.

END OF SECTION 101400

SECTION 102113 - SOLID-POLYMER TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes solid-polymer toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Sections:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for blocking
 - 2. Division 10 Section "Commercial Toilet Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for units, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).
- C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
 - 1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z (03G).
 - 2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvanized.

2.02 SOLID-POLYMER UNITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Accurate Partitions Corporation.
 - 2. Ampco, Inc.
 - 3. Bradley Corporation; Mills Partitions.
 - 4. Comtec Industries/Capitol Partitions.
 - 5. General Partitions Mfg. Corp.
 - 6. Global Steel Products Corp.
 - 7. Hadrian Manufacturing Inc.
 - 8. Knickerbocker Partition Corporation.
 - 9. Metpar Corp.
 - 10. Partition Systems Incorporated of South Carolina.
 - 11. Rockville Partitions Incorporated.
 - 12. Santana Products, Inc.
 - 13. Sanymetal; a Crane Plumbing company.
 - 14. Weis-Robart Partitions, Inc.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range.
 - 2. Edge Color: Through-color matching facing sheet color.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

F. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, chrome-plated zamac, stainless steel, or chrome-plated brass.

2.03 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's standard paired.
2. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.04 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M).
- C. Brass Castings: ASTM B584.
- D. Brass Extrusions: ASTM B455.
- E. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless Steel Castings: ASTM A743/A743M.
- G. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.05 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).

- b. Panels and Walls: 1 inch (25 mm).
- 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.02 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102226 - MANUALLY OPERATED ACOUSTICAL PANEL PARTITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes manually operated, acoustical panel partitions.
- B. Related Sections:
 - 1. Division 09 Section "Gypsum Board Assemblies" for sound barrier construction above the ceiling at track.
 - 2. Division 13 Section "Metal Building Systems" for supports that attach supporting tracks to overhead structural system.

1.03 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."
- B. NIC: Noise Isolation Class.
- C. NRC: Noise Reduction Coefficient.
- D. STC: Sound Transmission Class.

1.04 PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data for attachments, signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
- C. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing indicated.
 - 1. Include similar Samples of accessories involving color selection.

- D. Samples for Verification: For each type of exposed material, finish, covering, or facing indicated, prepared on Samples of size indicated below:
 - 1. Panel Facing Material: Manufacturer's standard-size unit, not less than 3 inches (75 mm) square.
 - 2. Panel Edge Material: Not less than 3 inches (75 mm) long.
 - 3. Hardware: Manufacturer's standard exposed door-operating device.
- E. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Plenum acoustical barriers.
- F. Qualification Data: For qualified Installer.
- G. Product Certificates: For each type of operable panel partition, from manufacturer.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each operable panel partition.
- I. Field quality-control reports.
- J. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - 2. Seals, hardware, track, carriers, and other operating components.
- K. Warranty: Sample of special warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- C. Forest Certification: Fabricate products with wood, wood veneers, and wood-based panel products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- D. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

- E. Preinstallation Conference: Conduct conference at Project site.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package panels. Do not use permanent markings on panels.

1.08 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of operable panel partition openings by field measurements before fabrication.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of operable panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal wear.
 - 2. Warranty Period: Two years from date of Final Acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Frame: Steel sheet, manufacturer's standard nominal minimum thickness for uncoated steel.
- B. Medium-Density Fiberboard: ANSI A208.2, made with binder containing no urea formaldehyde.

2.02 OPERABLE ACOUSTICAL PANELS

- A. Operable Acoustical Panels: Operable acoustical panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide 'Moderco, Inc. Signature Series 841' or comparable product by one of the following:
 - a. Advanced Equipment Corporation.
 - b. Curtition, Inc.
 - c. FolDoor; Holcomb & Hoke Mfg. Co., Inc.
 - d. Hufcor.
 - e. KWIK-WALL Company.
 - f. Modernfold, Inc.; a DORMA Group Company.
- B. Panel Operation: Manually operated, paired panels.
- C. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
 - 1. Panel Width: Standard widths.
- E. STC: Not less than 54.
- F. Panel Weight: 10 lb/sq. ft. (50 kg/sq. m) maximum.
- G. Panel Thickness: Not less than 4.25 inches (107.95 mm).
- H. Panel Closure: Manufacturer's standard.
- I. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.
 - 1. Hinges: Manufacturer's standard Concealed.

2.03 SEALS

- A. General: Provide types of seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
 - 1. Manufacturer's standard seals.
 - 2. Seals made from materials and in profiles that minimize sound leakage.
 - 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seal.
- C. Horizontal Top Seals:
 - 1. Continuous-contact, extruded-PVC seal exerting uniform constant pressure on track.
- D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.

2.04 FINISH FACING

- A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
 - 1. Apply one-piece, seamless facings free of air bubbles, wrinkles, blisters, and other defects, with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
 - 2. Color/Pattern: Insert manufacturer's name and designation for color and pattenr.
- B. Fabric Wall Covering: Manufacturer's standard Class A fire rated, stain resistant, moisture resistant, antimicrobial treated crypton wall panel upholstery fabric.
- C. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and

resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

2.05 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
 - 1. Panel Guide: Steel; finished with factory-applied, decorative, protective finish.
 - 2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
- C. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel.
- D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.
- E. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.06 ACCESSORIES

- A. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware and acoustical seals at soffit, floor, and jams. Hinges in finish to match other exposed hardware.
 - 1. Manufacturer's standard method to secure storage pocket door in closed position.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

- D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.03 ADJUSTING

- A. Adjust operable panel partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.04 FIELD QUALITY CONTROL

- A. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids; adjust partitions for acceptable fit.
- B. Repair or replace operable panel partitions that do not comply with requirements.

3.05 CLEANING

- A. Clean soiled surfaces of operable panel partitions to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 10 22 26

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Public-use washroom accessories.
 - 2. Hand dryers.
 - 3. Under-lavatory guards.
 - 4. Custodial accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: For each exposed product and for each finish specified, full size.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.
- D. Delegated-Design Submittal: For grab bars.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Final Acceptance.
- B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
 1. Warranty Period 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
 1. Subject to compliance with requirements, provide product by one of the following:
 - a. AJW Architectural Products.
 - b. American Specialties, Inc.
 - c. Bobrick Washroom Equipment, Inc.
 - d. Bradley Corporation.
 - e. GAMCO Specialty Accessories.
 - f. Tubular Specialties Manufacturing, Inc.
- B. Toilet Tissue (Roll) Dispenser [B-1; B-2]:

1. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
 2. Mounting:
 - a. B-1: Recessed.
 - b. B-2: Partition mounted.
 3. Operation: Non-control delivery with standard spindle.
 4. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) or 5-inch- (127-mm-) diameter tissue rolls.
 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- C. Combination Towel (Folded) Dispenser/Waste Receptacle [D]:
1. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 2. Mounting: Recessed with projecting receptacle.
 - a. Designed for nominal 4-inch (100-mm) wall depth.
 - b. Protrusion Limit: Installed unit protrudes maximum 4 inches (102 mm) from wall surface.
 3. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
 4. Minimum Waste-Receptacle Capacity: 10 gal. (37.9 L).
 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 6. Liner: Reusable, heavy-duty vinyl waste-receptacle liner.
 7. Lockset: Tumbler type for towel-dispenser compartment.
- D. Soap Dispenser [E]:
1. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
 2. Mounting: Vertically oriented, surface mounted.
 3. Capacity: 40 fl oz.
 4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 5. Lockset: Tumbler type.
 6. Refill Indicator: Window type.
- E. Grab Bar [A-1, A-2, A-3]:
1. Mounting: Flanges with concealed fasteners.
 2. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin).
 3. Outside Diameter: 1-1/2 inches (38 mm).
 4. Configuration and Length: As indicated on Drawings.
- F. Sanitary-Napkin Disposal Unit [F-1, F-2]:
1. Mounting:
 - a. F-1: Recessed.
 - b. F-2: Partition mounted.
 2. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
 3. Receptacle: Removable.

4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

G. Mirror Unit [C]:

1. Frame: Stainless steel channel.
 - a. Corners: Welded and ground smooth.
2. Size: As indicated on Drawings.
3. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

H. Hook [H]:

1. Description: Single-prong unit.
2. Mounting: Concealed.
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.3 HAND DRYERS

- A. Source Limitations: Obtain hand dryers from single source from single manufacturer.

B. Warm-Air Dryer [G]:

1. Description: Standard-speed, low profile, hands-free, warm-air hand dryer.
2. Mounting: Surface mounted.
 - a. Protrusion Limit: Installed unit protrudes maximum 4 inches (102 mm) from wall surface.
3. Operation: Infrared-sensor activated with timed power cut-off switch.
4. Maximum Sound Level: 87 dB.
5. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.4 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

1. Subject to compliance with requirements, provide product by one of the following:
 - a. AJW Architectural Products.
 - b. American Specialties, Inc.
 - c. Bobrick Washroom Equipment, Inc.
 - d. Bradley Corporation.
 - e. GAMCO Specialty Accessories.

f. Tubular Specialties Manufacturing, Inc.

B. Custodial Utility Shelf [J-1]:

1. Description: With exposed edges turned down not less than **1/2 inch (13 mm)** and supported by two triangular brackets welded to shelf underside.
2. Size: **24 inches (610 mm)** long by **6 inches (152 mm)** deep.
3. Material and Finish: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Utility Shelf with Hooks [J-2]:

1. Description: With exposed edges turned down not less than **1/2 inch (13 mm)** and supported by two triangular brackets welded to shelf underside.
2. Size: **24 inches (610 mm)** long by **6 inches (152 mm)** deep.
3. Hooks: Three – Four.
4. Material and Finish: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel, ASTM A480/A480M No. 4 finish (satin).

D. Custodial Mop and Broom Holder [K]:

1. Description: [Unit with shelf, hooks, holders, and rod suspended beneath shelf] <Insert description>.
2. Length: **24 inches (610 mm)**.
3. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.6 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, **0.031-inch- (0.8-mm-)** minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- C. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. 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.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 104413 - PORTABLE FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes: Fire-protection cabinets portable fire extinguishers.
- B. Related Requirements:
 - 1. Division 1 Section "Temporary Facilities and Controls" for construction fire extinguisher requirements.
 - 2. Division 10 Section "Fire Extinguishers."

1.03 PREINSTALLATION CONFERENCE

1.04 SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing semi-recessed and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Product Schedule: Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- E. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.05 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.02 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fire-End & Croker Corporation.

- b. GMR International Equipment Corporation.
 - c. Guardian Fire Equipment, Inc.
 - d. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - e. Larsens Manufacturing Company.
 - f. Modern Metal Products, Division of Technico Inc.
 - g. Nystrom, Inc.
 - h. Potter Roemer LLC.
 - i. Strike First Corporation of America.
- B. Cabinet Construction: Nonrated and 1-hour fire rated, coordinate with location.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick fire-barrier material. Provide factory-drilled mounting holes.
 - 2. Non-Rated Cabinets: Non-rated fire extinguisher cabinets to be installed in non-rated walls. 1-Hour fire rated fire extinguisher cabinets to be installed in 1-hour rated wall construction.
- C. Cabinet Material: Cold-rolled steel sheet.
- D. Semi-Recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Rolled-Edge Trim: 4-inch (102-mm) backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide recessed door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER".
 - 1) Location: Applied to cabinet glazing.
 - 2) Lettering Color: Red
 - 3) Orientation: Vertical
- K. Materials:
 - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: As selected by Architect from full range of finishes.
 - b. Color: As selected by Architect from full range of industry colors and color densities.

2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.03 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.04 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. General: Install so that top of cabinet is 48 inches above finish floor.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 1. Unless otherwise indicated provide semi-recessed fire-protection cabinets.
 2. Provide inside latch and lock for break-glass panels.
 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
 4. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions. Maintain fire ratings of fire rated walls.

5. Follow manufacturer's printed instructions for installation

3.04 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Sections:
 - 1. Division 1 Section "Temporary Facilities and Controls" for construction fire extinguisher requirements.
 - 2. Division 10 Section "Fire Extinguisher Cabinets" for semi-recessed fire extinguisher cabinets.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets
- B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.04 SUBMITTALS

- A. Warranty: Sample of special warranty.
- B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.06 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Final Acceptance.

PART 2 - PRODUCTS

2.01 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - h. Larsen's Manufacturing Company.
 - i. Moon-American.
 - j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
 - k. Potter Roemer LLC.
 - l. Pyro-Chem; Tyco Safety Products.
 - 2. Valves: Manufacturer's standard.
 - 3. Handles and Levers: Manufacturer's standard.
 - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.02 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Manufacturers: Provide products from same Manufacturer as the fire extinguishers.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

REGION 1 HEADQUARTERS

1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Heavy-duty metal lockers all welded type.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locker trim and accessories.
 - 2. Include locker identification system and numbering sequence.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For metal lockers and locker benches, in manufacturer's standard sizes.
- E. Qualification Data: For qualified Installer.
- F. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.
- G. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single manufacturer.
- C. Regulatory Requirements: Where metal lockers and benches are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1.
- D. Pre-Installation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver master and control keys to Owner by registered mail or overnight package service.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.07 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for All-Welded Metal Lockers: 10 years from date of Final Acceptance.

1.09 EXTRA MATERIALS

- A. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full size units of the following metal locker hardware items equal to five percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Locks.
 - b. Hooks.
 - c. Identification Panels.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 (ZF180) zinc-iron, alloy (galvannealed) coating designation.
- C. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch (19-mm) steel mesh, with at least 70 percent open area.
- D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
- E. Steel Tube: ASTM A 500, cold rolled.
- F. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- G. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.

2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.02 HEAVY-DUTY METAL LOCKERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 1. Art Metal Products; Bulldog Corridor Lockers.
 2. DeBourgh Mfg. Co.; Sentry Corridor/Personnel Lockers.
 3. List Industries Inc.; Marquis Protector.
 4. Lyon Workspace Products, LLC; All-Welded Lockers.
 5. Penco Products, Inc.; All-Welded Lockers.
 6. Locker MFG (Lockers Manufacturing); All-Welded Metal Lockers.
- B. Locker Arrangement: Double tier.
- C. Material: Cold-rolled steel sheet.
- D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 1. Tops, Bottoms, and Sides: 0.060-inch (1.52-mm) nominal thickness.
 2. Backs: 0.048-inch (1.21-mm) nominal thickness.
 3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.
- F. Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
 1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
 2. Door Style:
 - a. Louvered Vents: No fewer than six louver openings at top and bottom for single-tier lockers.
- G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 1. Continuous Hinges: Manufacturer's standard, steel, full height.
- H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.
 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.
- I. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:
 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 2. Coat Rods: For each compartment of single-tier metal lockers.
- J. Accessories:
 1. Continuous Zee Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch (1.52-mm) nominal-thickness steel sheet.

- a. Height: 4 inches (102 mm).
- 2. Boxed End Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- K. Finish: Baked enamel or powder coat.
 - 1. Color(s): As selected by Architect from manufacturer's full range.

2.03 FABRICATION

- A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- D. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- E. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- F. Coat Rods: Fabricated from 3/4-inch- (19-mm-) diameter steel, chrome finished.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
- H. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
- I. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.
- J. Recess Trim: Fabricated with minimum 2-1/2-inch (64-mm) face width and in lengths as long as practical; finished to match lockers.
- K. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- L. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- M. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

N. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.04 STEEL SHEET FINISHES

- A. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.
- B. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.
- C. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install level, plumb, and true; shim as required, using concealed shims.
 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 2. Anchor single rows of metal lockers to walls near top of lockers and to curb.
 3. Anchor back-to-back metal lockers to floor.
- B. All-Welded Metal Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 1. Attach hooks with at least two fasteners.
 2. Attach door locks on doors using security-type fasteners.
 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 4. Attach recess trim to recessed metal lockers with concealed clips.
 5. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 6. Attach sloping-top units to metal lockers, with closures at exposed ends.
 7. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
 8. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.03 ADJUSTING, CLEANING, AND PROTECTION

REGION 1 HEADQUARTERS

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 10 56 00 - STORAGE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 1098 Board, peg, tool (Ref. Part 2.1)
 - 2. 1106 Cabinet, six drawer, modular, underbench (Ref. Part 2.2)
 - 3. 1185 Cabinet, storage, shop (Ref. Part 2.3)
 - 4. 1421 Rack, arm, single face, six foot wide (Ref. Part 2.4)
 - 5. 1445 Storage unit, 48 bin (Ref. Part 2.5)
 - 6. 1456 Rack, bulk storage, six foot (Ref. Part 2.6)
 - 7. 1540 Rack, pallet, twelve foot, three tier (Ref. Part 2.7)
 - 8. 1688 Shelving unit, eight shelf (Ref. Part 2.8)
 - 9. 1966 Pallet, containment, hazardous materials, four drum (Ref. Part 2.9)
- B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.
- C. Utilities to be roughed in at location recommended by manufacturer.

1.3 QUALITY ASSURANCE

- A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years' experience supplying specified equipment.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
 - 2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
 - 3. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, shall be at the expense of the contractor.
- B. Operations and Maintenance Manual:
 - 1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
 - 2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
 - 3. Description of system and components.
 - 4. Schematic diagrams of electrical, plumbing, and compressed air system.
 - 5. Manufacturer's printed operating instructions.

6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

1.5 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

- A. Warrant work specified herein for one year from final acceptance against defects in materials, functions, and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. All parts shall be readily available locally in the United States.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.
- C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.1 BOARD, PEG, TOOL, WALL MOUNTED

Equipment Identifier: 1098

- A. Manufacturer's Reference:
 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
KENNEDY MANUFACTURING COMPANY	VAN WERT	OH	(800) 413-8665
Model No.: 50004UGY			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 MODERN METAL PRODUCTS	OWATONNA	MN	(800) 435 5544
ALT #2 DIAMOND LIFE	PENN HILLS	PA	(888) 983-4327

B. Capacities/Dimensions:

1. Overall capacities/dimensions/weight:

Overall Dimensions		
Length	Width	Height
72"	1/2"	36"
Weight		Capacity
32 lb		2592 lb

C. Features/Performance/Construction:

1. Panels shall be steel reinforced with square hole perforations. Flanged panels shall be reinforced to support heavy loads.
2. Panels shall be capable of being attached to any surface that can support the weight of heavy tools (fasteners not included).
3. Panels shall be manufactured of chip resistant material that will withstand abuse over time.
4. Individual panels shall be 18 by 36 inches and be assembled so that the complete length of the four-panel system shall be 72 inches.
5. Hooks, clips, and accessories shall be heavy-duty steel and capable of locking onto the panel.
6. The tool board system shall include the following (60 piece set) items:
 - a. Single hooks, 33 each, 20 pound capacity
 - b. Double hooks, nine each, 30 pound capacity
 - c. Pliers' hooks, four each
 - d. Spring clips, 10 each
 - e. Screwdriver unit, one each
 - f. Wrench rack, one each
 - g. Hex key unit, one each

D. Finish: Gray, durable chip-resistant baked on finish

2.2 CABINET, SIX DRAWER, MODULAR, UNDERBENCH

Equipment Identifier: 1106

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
EQUIPTO Model No.: 4433H	TATAMY	PA	(800) 323-0801

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 LYONS WORKSPACE PRODUCTS	MONTGOMERY	IL	(800) 323-0082
ALT #2 STANLEY VIDMAR	ALLENTOWN	PA	(800) 523-9462

B. Capacities/Dimensions:

1. Overall weight, capacity, and dimensions:

Overall Dimensions		
Length	Width	Height
30"	27 3/4"	33 1/2"
Weight		Capacity
350 lb		2400 lb

2. Quantity of drawers: Six
3. Drawer capacity: 400 pounds each (minimum)
4. Drawer dimensions:
 - a. Usable width: 18-3/4 inches
 - b. Usable depth: 25-1/8 inches
 - c. Drawer usable height (drawers numbered top to bottom):
 - 1) Drawer 1: 3 inches
 - 2) Drawers 2, 3, and 4: 4-1/2 inches
 - 3) Drawers 5 and 6: 6 inches

C. Features/Performance/Construction:

1. Cabinet shall be heavy gauge channel formed sheet steel with mountings permitting installation of various height drawers, front columns with drilled and tapped bolt holes.
2. Base design shall include front and rear forklift openings of ample strength to permit moving of fully loaded cabinet. Front base plate shall be provided. Base shall be drilled for bolting to the floor.
3. Drawer suspension shall be designed for total interchangeability for all drawer heights. Sealed steel roller bearing system shall permit full drawer extension at rated capacity without sagging.
4. Drawers and trays shall be fabricated of smooth sheet metal with partition and divider mounting hole grid punched on 3/4-inch centers. Drawer walls shall be slotted on 3/4-inch centers for mounting dividers and partitions.
5. Drawer pulls shall be nominal 3/4 drawer width with 1-inch-high label holder provided with paper labels and protective vinyl shields and end caps.
6. Drawer dividers shall have a minimum of 12 divided sections.
7. Drawer heights shall be available in front heights of 3 to 12 inches in not over 1-1/2-inch increments.
8. Drawer dividers (drawers numbered top to bottom):
 - a. Drawer 1: Divider set, Equipto No. 4133F10 (one each)
 - b. Drawer 2, 3, 4: Divider set, Equipto No. 4134F15 (three each)
 - c. Drawer 5, 6: Divider set, Equipto No. 4135F20 (two each)
9. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:

Description	Manufacturer	Model No.	Qty.
STAINLESS STEEL TOP (30" W x 27-3/4" D)	EQUIPTO	445-30SSW4	1

- E. Finish: Phosphate primer covered by durable enamel in Owner's choice of manufacturer's standard color.

2.3 CABINET, STORAGE, SHOP

Equipment Identifier: 1185

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
EQUIPTO	TATAMY	PA	(800) 323-0801
Model No.: 1710			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 LYONS WORKSPACE PRODUCTS	MONTGOMERY	IL	(800) 323-0082
ALT #2 REPUBLIC STORAGE PRODUCTS	MONTGOMERY	IL	(800) 477-1255

B. Overall Capacities/Dimensions/Weights:

1. Overall dimensions:

Overall Dimensions		
Length	Width	Height
36"	18"	78"
Weight		Capacity
138 lb		800 lb

2. Space the four adjustable shelves evenly, approximately 14 inches center to center
3. Shelf capacity: 200 pounds per shelf
4. Unit weight: 156.4 pounds

C. Features/Performance/Construction:

1. Four adjustable shelves, flanged, constructed of 22 gauge steel. Shelf adjustments shall be on maximum 2 inch centers without removing fasteners.
2. Doors shall have a three-point locking system with factory key-lockable handle. Doors shall open a full 180 degrees and be flush mounted when closed with latching actuated cast steel handle.
3. Each door shall be hinged on three welded heavy-duty steel pin hinges.
4. Back, front, and sides shall be flush with no bolt heads on front or sides.
5. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

- D. Finish: Owner's choice of manufacturer's standard color (standard color chart available).

2.4 RACK, ARM, SINGLE FACE, SIX FOOT WIDE

Equipment Identifier: 1421

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
EQUIPTO	TATAMY	PA	(610) 253-2775
Model No.: 1062-72 WITH 1063			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 LYON WORKSPACE PRODUCTS	MONTGOMERY	IL	(630) 892-8941
ALT #2 MODERN EQUIPMENT COMPANY INC	OMAHA	NE	(800) 228-7334

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
74"	22 1/4"	84"
Weight		Capacity
135 lb		4550 lb

C. Features/Performance/Construction:

1. Continuously welded heavy gauge steel unit shall have three lateral brace panels and four diagonal braces.
2. Uprights shall be pierced on nominal 2 inch centers for vertical adjustment of arms.
3. Seven arms shall be included for each upright, 14 total per single section.
 - a. Arm capacity: 325 pounds each
4. An extra upright frame shall be provided to finish each row.
5. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Finish: Powder coated in Owner's choice of manufacturer's standard colors.

2.5 STORAGE UNIT, 48 BIN

Equipment Identifier: 1445

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

Manufacturer	City	State	Phone
EQUIPTO	TATAMY	PA	(610)-253-2775
Model No.: 673-9S STARTER AND 673-9A ADD ON			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 STANLEY VIDMAR	ALLENTOWN	PA	(800) 523-9462
ALT #2 LYON WORKSPACE PRODUCTS	AURORA	IL	(630) 892-8941

B. Capacities/Dimensions:

1. Overall dimensions:

Overall Dimensions		
Length	Width	Height
36"	18"	84"
Weight		Capacity
590 lb		4900 lb

2. Bin dimensions:

- a. Length: 8-1/2 inches
- b. Width: 17-1/2 inches
- c. Height: 6 inches

3. Bin quantity: 48

4. Unit weight: 374.7 pounds

5. Capacity:

- a. Per shelf: 700 pounds
- b. Total capacity: 4,900 pounds

C. Features/Performance/Construction:

- 1. Cabinet shall be constructed of steel.
- 2. The V-Grip Bins which form this item shall have removable upper back panel between units providing 18 36-inch deep compartments. The bottom wall sections shall be removed to accommodate materials 18 to 36 inches in length.
- 3. Speedclips for attachments of the two V-grip full-height shelf dividers.

D. Finish: Durable enamel in manufacturer's standard color.

2.6 RACK, BULK STORAGE, SIX FOOT

Equipment Identifier: 1456

A. Manufacturer's Reference:

- 1. Prime Manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
EQUIPTO	TATAMY	PA	(800) 323-0801
Model No.: 1028D62S AND 1028D62A			

- 2. Alternate Manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 LYON WORKSPACE PRODUCTS	MONTGOMERY	IL	(800) 323-0082
ALT #2 REPUBLIC STORAGE PRODUCTS	MONTGOMERY	IL	(800) 477-1255

B. Overall Capacities/Dimensions:

1. Overall dimension, weight, and capacity:

Overall Dimensions		
Length	Width	Height
72"	24"	96"
Weight		Capacity
210 lb		5260 lb

2. Beams:

- a. Capacity: 2,630 pounds per pair of beams
- b. Dimensions:
 - 1) Length: 72 inches
 - 2) Width: 1-5/8 inches
 - 3) Height: 4 inches
- c. Number of beams per rack section: Eight total (2 per shelf)
- d. Installed beam height from finished floor:
 - 1) Top beam: 96 inches
 - 2) Middle beam (first): 72 inches
 - 3) Middle beam (second): 36 inches
 - 4) Bottom beam: 6 inches
 - 5) Verify beam heights with Owner prior to installation

3. Uprights:

- a. Capacity: 5,260 pounds per upright
- b. Dimensions:
 - 1) Width: 1-5/8 inches
 - 2) Spacing: 24 inches
 - 3) Height: 96 inches
- c. Number of uprights per rack section: Two minimum

4. Weight: 220 pounds

C. Features/Performance/Construction:

1. Beams:

- a. Construction: Beams shall be solid shaped welded heavy gauge steel with heavy beam clips MIG-welded to beam ends.
- b. Attachment: Beam clips shall have three beam hooks each for insertion into upright slots.

2. Supports: Tie bars for each pair of beams shall fit into slots in beams. There shall be a minimum of two supports provided for each pair of beams.

3. Uprights:

- a. Construction: Upright posts shall be heavy duty 1-5/8 by 1-13/16 inch welded 16 gauge steel with tubular steel cross and diagonal members.
- b. Adjustment: Upright posts shall have tapered slots on 1-1/2 inch centers for vertical beam adjustment

4. Decking:

- a. Construction: Decking shall be 18 gauge corrugated shaped steel.
- b. Capacity: Decking shall have a capacity of 2,778 pounds but load is limited to support capacity of beams and uprights.

5. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Finish: Durable enamel in Owner's choice of manufacturer's standard colors.

2.7 RACK, PALLET, TWELVE FOOT, THREE TIER

Equipment Identifier: 1540

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

Manufacturer	City	State	Phone
LYON WORKSPACE PRODUCTS	MONTGOMERY	IL	(800) 323-0082
Model No.: 97SWD144048144 STARTER WITH 97AWD144042144 ADD ON			

B. Capacities/Dimensions:

1. Overall Dimensions:

Overall Dimensions		
Length	Width	Height
150"	48"	144"
Weight		Capacity
0 lb		20370 lb

2. Capacity: 6,790 pounds per tier; 20,370 pounds total
3. Uprights:
 - a. Thickness: 3 inches wide by 3 inches deep
4. Beams:
 - a. Dimensions:
 - 1) Length: 144 inches
 - 2) Thickness: 4-1/4 inches
 - b. Installed beam height from finished floor:
 - 1) Top beams: 144 inches
 - 2) Remaining beam levels: 48 inch spacing
 - 3) Verify beam heights with Owner prior to installation
5. Decking:
 - a. Width: 46 inches
 - b. Depth: 48 inches
 - c. Number of channels: Three
 - d. Panels per shelf: Three

C. Features/Performance/Construction:

1. Beams:
 - a. Construction: Beams shall be welded, step-type, 14 gauge steel box channel.
 - b. Attachment: High tensile studs, four each on each end shall engage tapered keyhole slots in uprights. Integral safety catch automatically snaps and locks into place when beam is properly seated.
2. Uprights:
 - a. Construction: Continuously MIG welded, heavy gauge steel box section uprights shall have deep channel cross and diagonal K-brace members.
 - b. Adjustment: Tapered keyhole slots on 2 inch centers shall be provided for vertical beam adjustments.

- c. Base plate: Heavy gauge steel shall be LAP welded to upright with holes for anchoring to floor.
- d. Row ends: An extra upright frame shall be provided to finish each row as indicated on equipment drawings.
- 3. Decking:
 - a. Wire mesh: Continuously MIG welded, 2-1/2 by 4 inches by 6 gauge
 - b. Support channels: 14 gauge steel
- 4. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.
- D. Finish: Durable enamel in Owner's choice of manufacturer's standard colors.

2.8 SHELVING UNIT, EIGHT SHELF

Equipment Identifier: 1688

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
EQUIPTO Model No.: 773-8S AND 773-8A	TATAMY	PA	(800) 323-0801

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 LYON WORKSPACE PRODUCTS	MONTGOMERY	IL	(800) 323-0082
ALT #2 BORROUGHS COPORATION	KALAMAZOO	MI	(800) 748-0227

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
36"	18"	84"
Weight		Capacity
176 lb		1170 lb

2. Number of shelves: Eight
3. Shelf capacity: 1170 pounds per shelf
4. Installed height from finished floor, nominal:
 - a. Bottom shelf: 4-1/2 inches
 - b. Top shelf: 84 inches
 - c. Space remaining bottom six shelves evenly, approximately 12 inches center to center, and the top two shelves 10-1/2 inches center to center

C. Features/Performance/Construction:

1. Shelf construction shall be double flange 18 gauge steel and double flanged box-formed edges on all four sides.
2. Uprights shall be double flanged uprights with tapered bracket slots punched on 1-1/2 inch centers for vertical shelf adjustment.

3. Shelf fastening shall consist of slip-in shelf brackets which reinforce and securely lock shelf into place in all four corners.
4. Units shall share common end panels with adjoining units. Back-to-back units shall be joined with common upright joints.
5. Provide seismic bracing and anchoring to meet any local, state, and national codes and provisions.

D. Accessories:

Description	Manufacturer	Model No.	Qty.
ANCHORS, FLOOR (center)	EQUIPTO	190317A	1
ANCHORS, FLOOR (left ends)	EQUIPTO	190319A	1
ANCHORS, FLOOR (right ends)	EQUIPTO	190320A	1

E. Finish: Durable enamel in owner's choice of manufacturer's standard colors

2.9 PALLET, CONTAINMENT, HAZARDOUS MATERIALS, FOUR DRUM

Equipment Identifier: 1966

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

Manufacturer	City	State	Phone
JUSTRITE MANUFACTURING	DES PLAINES	IL	(847) 298-9250
Model No.: 28635			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 EAGLE MANUFACTURING	WELLSBURG	WV	(304) 737-3171
ALT #2 EMPAC	EAST LAKE	OH	(440) 975-0070

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
49"	49"	10 1/4"
Weight		Capacity
53 lb		5000 lb

2. Capacity: 5,000 pounds, four drums, 55-gallon capacity each
3. Sump capacity: 73 gallons
4. Weight: 53.6 pounds
5. Ramp (Justrite No. 28620)
 - a. Dimensions:
 - 1) Length: 49 inches
 - 2) Width: 33 inches

- 3) Height: 10-1/4 inches
 - b. Capacity: 1,000 pounds, minimum
 - c. Ramp weight: 40.0 pounds
- C. Features/Performance/Construction:
 - 1. Pallet shall be constructed of recycled polyethylene.
 - 2. The deck shall be open grate to contain spills.
 - 3. Ramp shall be constructed of same material as pallet.
- D. Finish: Durable polyethylene in manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

- A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.
- B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
 - 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
 - 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 - 3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
- C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

- A. After final installation is complete and prior to authorizing payment, specified equipment shall be checked with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.5 TRAINING

- A. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 10 56 00

SECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes ground-mounted aluminum flagpoles.
- B. Related Requirements:
 - 1. Section 013100 "Project Management" for contractor submittal of Federal Aviation Administration (FAA) CFR Title 14 Part 77.9 (Construction or Alteration Requiring Notice) Submittal prior to starting construction activities.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the design criteria determined by the design build designer.
 - 1. 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 Specification for Design of Metal Flagpoles" whichever is more stringent.
 - 2. Base flagpole design on maximum standard-size flag suitable for use with pole or flag size indicated, whichever is more stringent.
 - 3. Basic Wind Speed: Refer to Structural Drawing S0-101 – Structural Notes.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include load and point reactions.
 - 2. Submittal of Federal Aviation Administration CFR Title 14 Part 77.9 (Construction or Alteration Requiring Notice) for proposes structures in proximity to an airport.
- C. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. American Flagpole; a Kearney-National Inc. company.
 2. Atlantic Fiberglass Products, Inc.
 3. Baartol Company.
 4. Concord Industries, Inc.
 5. Eder Flag Manufacturing Company, Inc.
 6. Ewing Flagpoles.
 7. Flagpole Warehouse.
 8. Lingo Inc.; Acme Flagpole Company Division.
 9. Millerbernd Manufacturing Company.
 10. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
 11. PLP Composite Technologies, Inc.
 12. Pole-Tech Company Inc.
 13. U.S. Flag & Flagpole Supply, LP.
 14. USS Manufacturing Inc.

2.2 FLAGPOLES

- A. Aluminum Flagpoles: Fabricate from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16 inch (0.1875 inch), tensile strength not less than 30,000 psi, and a yield point of 25,000 psi. Heat-treat and age-harden after fabrication.
1. Provide entasis-tapered clear anodized satin finish aluminum flagpole with gold anodized finish aluminum ball finial.
 2. Flagpole Exposed Height: 25' (twenty-five-feet) for US Flag, 20' (twenty feet) for NC Flag.
 3. Quantity: As shown on site plans, location to be coordinated with Owner.
 4. Construction: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - a. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - b. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
 5. Flashing Collar: Same material and finish as flagpole.
 6. Sleeve for Aluminum Flagpole: Foundation sleeve, made to fit flagpole, for casting into concrete foundation.
- B. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- (1.6-mm-) nominal wall thickness. 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 welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole. Provide flashing collar of same material and finish as flagpole.
- C. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter. Fabricate from 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.

- D. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
- E. Halyard Flag Snaps: Provide two swivel snap hooks per halyard.

2.3 MISCELLANEOUS MATERIALS

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- B. Sand: ASTM C 33, fine aggregate.
- C. Elastomeric Joint Sealant: Joint sealant complying with requirements in Division 07 Section "Joint Sealants."

2.4 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] [AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 - 1. Color: As selected by Owner from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 FLAGPOLE INSTALLATION

- A. General: Coordinate location of flagpole with Owner/Architect/Civil Engineer. Install flagpole per manufacturer's recommendations and according to shop drawings.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107500

SECTION 11 11 00 - VEHICLE SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 7540 Pump, diaphragm, used fluid evacuation (UO) (Ref. Part 2.1)
 - 2. 7541 Pump, diaphragm, used fluid evacuation (UC) (Ref. Part 2.2)
 - 3. 7958 Tank, double wall, cube, 240 gallon (commodity) (Ref. Part 2.3)
 - 4. 7995 Receiver, 25 gallon, portable (UC) (Ref. Part 2.4)
 - 5. 7996 Receiver, 25 gallon, portable (UO) (Ref. Part 2.5)
- B. Roughing-in installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Representative:
 - 1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
 - 2. Training: Provide a qualified manufacturer's representative to provide training to the Owner's maintenance personnel in operation and maintenance of specified equipment.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
 - 2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- B. Operations and Maintenance Manual:
 - 1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
 - 2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
 - 3. Description of system and components.
 - 4. Schematic diagrams of electrical, plumbing, and compressed air system.
 - 5. Manufacturer's printed operating instructions.
 - 6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.
- C. Shop Drawings: Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.

1.5 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

- A. Warrant work specified herein for one year from final acceptance against defects in materials, functions, and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.
- C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.8 LABELING

- A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.
- B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.
- C. Provide air receivers meeting requirements of ASME Code for Unfired Pressure Vessels and carry ASME approval stamp.

PART 2 - PRODUCTS

2.1 PUMP, DIAPHRAGM, USED FLUID EVACUATION (UO)

Equipment Identifier: 7540

- A. Manufacturer's Reference:
 - 1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standards of quality, performance, features and construction.

Manufacturer	City	State	Phone
GRACO, INCORPORATED	MINNEAPOLIS	MN	(800) 533-9655
Model No.: 647731			
007-580			

d. Reference Equipment Drawings: Service Equipment Layout Plan

2. Alternate manufacturers: Contingent upon compliance with these specification and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

	Manufacturer	City	State	Phone
ALT #1	BALCRANK, CORPORATION	WEAVERVILLE	NC	(828) 645-4261
ALT #1	LINCOLN INDUSTRIAL	WEAVERVILLE	NC	(314) 645-4261

B. Capacities/Dimensions:

1. Products: Used oil
2. Pump ratio: 1:1
3. Maximum fluid outlet pressure: 100 PSI
4. Maximum fluid working pressure: 100 PSI
5. Maximum free flow rate: 50 GPM
6. Continuous duty delivery: 15.81 to 23.8 GPM
7. Air inlet: 1/2 inch NPT(F)
8. Fluid outlet: 1 inch NPT(F)
9. Fluid inlet: 1 inch NPT(F)
10. Tank overflow gauge: 2 inch NPT

C. Features/Performance/Construction:

1. Diaphragm pump shall provide 100 PSI air pressure for pump size and capacity as scheduled.
2. Pump shall be provided in complete assembly, including the following:
 - a. Wall bracket accessory kit, Graco Model No. 24C637; includes lock nut, cylindrical damper, wall mount bracket, and washer.
 - b. Fluid installation kit, Graco Model No. 240685, includes swivel union, 4 foot coupled fluid hose, short nipple, y-strainer, 10 foot coupled fluid hose, ball valve, and elbow.
 - c. Combination filter regulator and gauge, 3/4 inch NPT, Graco Model No. 133217.
 - d. Reducing pipe adapter, 3/4" NPT M, - 1/2" (F), Graco Model No. 168595
 - e. 4 foot air hose, 1/2" NPT (M) X, NPT (M) Graco Model No. 110046
 - f. Quick-Connect Coupler 1/2" NPT (F), Graco Model No. 110199
 - g. Quick-Connect Nipple, 1/2" NPT (M), Graco Model No. 110196
 - h. Grounding wire and clamp, Graco Model No. 238909
 - i. Air muffler, Graco Model No. 102656
 - j. Provide label "USED OIL" on pump to identify product (minimum 1 inch lettering)
 - k. Bleed-type air valve, Graco Model No. 110226
3. Materials: Compatible with product being delivered.
4. Pump shall handle oil, hydraulic oil, automatic transmission fluid.
5. Pump shall have a monitoring system that shuts off the pump via solenoid valve when the used fluid tank is full.
 - a. Monitoring system shall notify users with a strobe light and an audible alarm system.
 - 1) Manufacturer: BJ Enterprises, (636) 825-7200
 - 2) Monitoring system power supply and solenoid valve: BJE Model No. 007-580, one each
 - 3) Strobe light: BJE Model No. 007-695, one each
 - b. Audible alarm shall draw 10 to 50 milliamps.

D. Accessories:

Description	Manufacturer	Model No.	Qty.
EXPLOSION PROOF SOLENOID VALVE	ASCO	EF8210G35	1

E. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	0	2.00	RECEPTACLE

Plumbing		
Domestic Water		
Connection (IN)	Flow Rate(CFM)	Capacity (PSI)

Natural Gas			
Connection (IN)	Capacity (BTU/Hr)	Pressure (PSI)	
		Minimum	Maximum

Compressed Air			
Connection (IN)	Flow Rate (CFM)	Pressure (PSI)	
		Minimum	Maximum
1/2"	64.00	100.00	100.00 psi

2.2 PUMP, DIAPHRAGM, USED FLUID EVACUATION (UC)

Equipment Identifier: 7541

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standards of quality, performance, features and construction.

Manufacturer	City	State	Phone
GRACO, INCORPORATED	MINNEAPOLIS	MN	(800) 533-9655
Model No.: 007-580 647016			

2. Alternate manufacturers: Contingent upon compliance with these specification and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 BALCRANK, CORPORATION	WEAVERVILLE	NC	(828) 645-4261
ALT #2 LINCOLN INDUSTRIAL	ST. LOUIS	MO	(314) 679-4200

B. Capacities/Dimensions:

1. Products: Used coolant
2. Pump ratio: 1:1

3. Maximum fluid outlet pressure: 100 PSI
4. Maximum fluid working pressure: 100 PSI
5. Maximum free flow rate: 50 GPM
6. Continuous duty delivery: 15.81 to 23.8 GPM
7. Air inlet: 1/2 inch NPT(F)
8. Fluid outlet: 1 inch NPT(F)
9. Fluid inlet: 1 inch NPT(F)
10. Tank overfill gauge: 2 inch NPT

C. Features/Performance/Construction:

1. Diaphragm pump shall be provided with 100 PSI air pressure for pump size and capacity as scheduled.
2. Pump shall be provided in complete assembly, including the following:
 - a. Wall bracket accessory kit, Graco Model No. 24C637; includes lock nut, cylindrical damper, wall mount bracket, and washer.
 - b. Drum style adapter kit, Graco Model No. 240832, includes elbow, nipple, valve, male and female camlock couplers.
 - c. Fluid installation kit, Graco Model No. 240685, includes swivel union, 4 foot coupled fluid hose, short nipple, y-strainer, 10 foot coupled fluid hose, ball valve, and elbow.
 - d. Combination filter regulator and gauge, 3/4-inch NPT, Graco Model No. 246948.
 - e. Reducing pipe adapter, 3/4" NPT M, - 1/2" (F), Graco Model No. 168595
 - f. 4 foot air hose, 1/2" NPT (M) X, NPT (M), Graco Model No. 110046
 - g. Quick-Connect Coupler 1/2" NPT (F), Graco Model No. 110199
 - h. Quick-Connect Nipple, 1/2" NPT (M), Graco Model No. 110196
 - i. Grounding wire and clamp, Graco Model No. 238909.
 - j. Air muffler, Graco Model No. 112182.
 - k. Provide label "USED COOLANT" on pump to identify product (minimum 1 inch lettering)
 - l. Bleed-type air valve, Graco Model No. 110226
3. Materials: Compatible with product being delivered.
4. Pump shall handle coolant.
5. Pump shall have a monitoring system that shuts off the pump via solenoid valve when the used fluid tank is full.
 - a. Monitoring system shall notify users with a strobe light and an audible alarm system.
 - 1) Manufacturer: BJ Enterprises, (636) 825-7200
 - 2) Monitoring system power supply and solenoid valve: BJE Model No. 007-580, one each
 - 3) Strobe light: BJE Model No. 007-695, one each
 - b. Audible alarm shall draw 10 to 50 milliamps.

D. Accessories:

Description	Manufacturer	Model No.	Qty.
EXPLOSION PROOF SOLENOID VALVE	ASCO	EF8210G35	1

E. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	0	2.00	RECEPTACLE

PLUMBING			
Domestic Water			
Connection (IN)	Flow Rate(CFM)		Capacity (PSI)
Natural Gas			
Connection (IN)	Capacity (BTU/Hr)	Pressure (PSI)	
		Minimum	Maximum
Compressed Air			
Connection (IN)	Flow Rate (CFM)	Pressure (PSI)	
		Minimum	Maximum
1/2"	64.00	80.00	150.00 psi

2.3 TANK, DOUBLE WALL, CUBE, 240 GALLON (UC, UO)

Equipment Identifier: 7958

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
CONTAINMENT SOLUTIONS	CONROE	TX	877-274-8265
Model No.: LCAA1124008530			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 ATLANTIC CONTAINMENT	MCGAHEYSVILLE	VA	800-522-4980
ALT #2 EATON SALES & SERVICE, LLC	DENVER	CO	303-296-4800

B. Capacities/Dimensions:

1. Overall dimensions, weight, and capacity:

Overall Dimensions		
Length	Width	Height
50"	40"	49"
Weight		Capacity
850 lb		2850 lb

2. Spill box height: 12 inches
3. Capacity: 240 gallons

C. Features/Performance/Construction:

1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized Above Ground Storage Tank standards, including: Uniform Fire Code, Nation Fire Protection Association 30, 30A, and 31, Underwriters Laboratory Standard 142-for single wall tanks.

2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.
3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of one PSI.
4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.
5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.
6. Primary tank enclosure:
 - a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds. Tank shall be equipped with lifting lugs.
 - b. Primary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.
 - c. Tank enclosure shall be supported by two four-inch high steel support feet channels with internal anchoring holes to maintain ground clearance. (Remove support feet channels prior to installation.)
7. Secondary tank enclosure:
 - a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
 - b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.
 - c. Secondary enclosure shall be equipped with a 2 inch monitoring port and a 4 or 6 or 8 inch emergency vent port as required by Underwriters Laboratories.
 - d. Secondary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.
 - e. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.
8. Double float tank gauge that is calibrated by gallons or inches (Scully Golden Gauge or approved equal). Select gauge to match tank depth.
9. Spill box: 7 gallon, welded to tank with ½ inch drain (Containment Solutions No. SBB002).
10. Venting:
 - a. Primary:
 - 1) Primary working vent: 2 inches NPT(M) (Containment Solutions No. 20000592). Vent through roof for used fluids.
 - 2) Primary emergency vent: 4 inches NPT(M) (Containment Solutions No. 20000596)
 - b. Secondary:
 - 1) Secondary emergency vent: 4 inches NPT(M) (Containment Solutions No. 20000596)
11. Anchor clips: Anchor tank to floor (Containment Solutions No. ACB005).

D. Accessories:

Description	Manufacturer	Model No.	Qty.
TANK MONITORING SYSTEM WITH ALARM (FOR USED FLUID TANKS)	BJ ENTERPRISES	007 575	1

E. Utilities:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	0	2.00	RECEPTACLE

F. Finish: Durable enamel in manufacturer's standard color

2.4 RECEIVER, 25 GALLON, PORTABLE (UC)

Equipment Identifier: 7995

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
GRACO, INC.	MINNEAPOLIS	MN	(800) 533-9655
Model No.: 248632			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 BALCRANK	WEAVERVILLE	NC	825-645-4261
ALT #2 SAMSON	SWANNOANO	NC	828-686-8511

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
26"	24"	45"
Weight		Capacity
54 lb		451 lb

2. Fluid inlet/inspection port size: 3 inch buttress
3. Capacity: 25 gallons
4. Fluid outlet fitting size: 3/4 inch NPT
5. Collection funnel size: 24 by 24 inches

C. Features/Performance/Construction:

1. Unit shall be constructed of polyethylene.
2. Unit shall include a 3/4 inch gravity feed drain valve and a quick disconnect method of suction-evacuation from the top of the unit.
3. Unit shall be mounted on semi-pneumatic, synthetic rubber wheels and polyurethane front casters.
4. Unit shall contain a funnel assembly capable of extending to 69 inches.
5. Unit shall be dent, rust, and corrosion resistant.
6. Unit shall be capable of handling coolant at temperatures below 30 degrees F to above 105 degrees F.
7. Tank shall be equipped with tool holders and sight gauge.
8. Tank shall be equipped with a removable filter to prevent debris from entering the tank.

D. Finish: Polyethylene complete with necessary markings to readily identify contents.

2.5 RECEIVER, 25 GALLON, PORTABLE (UO)

Equipment Identifier: 7996

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
GRACO, INC. Model No.: 238866	MINNEAPOLIS	MN	800-533-9655

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 BALCRANK	WEAVERVILLE	NC	828-645-4261
ALT #2 SAMSON	SWANNANOVA	NC	828-686-8511

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
24"	24"	45"
Weight		Capacity
54 lb		451 lb

2. Fluid inlet/inspection port size: 3 inch buttress
3. Fluid outlet fitting size: 3/4 inch NPT
4. Collection funnel size: 22 by 24 inches
5. Capacity: 25 gallons

C. Features/Performance/Construction:

1. Unit shall be constructed of polyethylene.
2. Unit shall include a gravity feed drain valve and suction-evacuation from the top of the unit.
3. Unit shall be mounted on semi-pneumatic, synthetic rubber wheels and polyurethane front casters.
4. Unit shall contain a funnel assembly capable of extending to 69 inches.
5. Unit shall be dent, rust, and corrosion resistant.
6. Unit shall be capable of handling oil at temperatures of below 30 degrees F to above 120 degrees F, with a maximum oil temperature of 220 degrees F.
7. Tank shall be equipped with tool holders and a sight gauge.
8. Tank shall be equipped with a removable filter to prevent debris from entering the tank.

- D. Finish: Polyethylene complete with necessary markings to readily identify contents.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

- B. Inspect equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

- A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.
- B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
 - 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
 - 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 - 3. Anchorage: Attach equipment as detailed or directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
 - 4. Fluid storage tanks:
 - a. Tank shall be seismically braced and anchored to meet all local, state, and federal codes and provisions.
 - b. Used oil tank shall be vented to the outside of the building.
 - c. Remove support feet channels prior to final installation.
- C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.5 TRAINING

- A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
 - 1. 7540 Pump, diaphragm, used fluid evacuation (UO); 1 hours (minimum)
 - 2. 7541 Pump, diaphragm, used fluid evacuation (UC); 1 hours (minimum)
 - 3. 7995 Receiver, 25 gallon, portable (UC); 1 hours (minimum)
 - 4. 7996 Receiver, 25 gallon, portable (UO); 1 hours (minimum)
- B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 00

SECTION 11 11 13 - COMPRESSED AIR VEHICLE SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 8082 Compressor, air, screw, rotary, duplex 10 hp (x2), horizontal receiver, with integral air dryer (Ref. Part 2.1)
- B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.
- C. Piping, wiring, and switching between equipment and utilities.

1.3 RELATED SECTIONS

- A. Section 22 05 48 – Vibration and Seismic Controls Plumbing Piping Equipment
- B. Section 40 12 13 – Breathable Air Systems

1.4 REFERENCES

- A. ASME Code for Unfired Pressure Vessels

1.5 DEFINITIONS

- A. Actual Air: Air delivered at air-compressor outlet. Flow rate is compressed air delivered and measured in acfm.
- B. Standard Air: Free air at 68 deg and 1 atmosphere (before compression or expansion and measured in scfm).

1.6 QUALITY ASSURANCE

- A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
- B. Manufacturer's Representative:
 - 1. Installation: Provide a qualified manufacturer's representative with a minimum of 5 years experience at site to supervise work related to equipment installation, check out, and start up.
 - 2. Training: Provide a qualified manufacturer's representative to provide training to the Owner's maintenance personnel in operation and maintenance of specified equipment.

1.7 STANDARD AND REGULATORY REQUIREMENTS

- A. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic, fire, and racking codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.8 SUBMITTALS

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page. Include certified data for each unit and accessory system indicating the following:
 - a. Air compressor performance curves at summer design condition
 - b. Intercooler performance at summer design condition
 - c. Air dryer performance at 38 degrees F, dew point at 175 PSIG
3. Indicate components, assembly, dimensions, weights and loadings, required clearances, location and size of field connections, intake air filter outline, blow-off silencer outline, main motor drive data, aftercoolers, control panel, and electrical pneumatic schematics.
4. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories shall be a cause for rejection.

B. Shop Drawings:

1. Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.
2. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.
3. Include plans, elevations, sections, and installation details.
4. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
6. Include diagrams for power, signal, and control wiring.

C. Operations and Maintenance Manual:

1. Assemble and provide copies of manual 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.
2. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
3. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:
 - a. Description of system and components.
 - b. Schematic diagrams of electrical, plumbing and compressed air systems.
 - c. Manufacturer's printed operating instructions.
 - d. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.
 - e. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

1.9 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.10 WARRANTY

- A. Warrant work specified herein for at least one year from final acceptance against defects in materials, functions, and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

1.11 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.
 - 1. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.
- B. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.12 LABELING

- A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.
- B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.
- C. Provide air receivers meeting requirements of ASME Code for Unfired Pressure Vessels and carry ASME approval stamp.

1.13 GENERAL REQUIREMENTS FOR AIR COMPRESSORS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors, dryers, and receivers that deliver air of quality equal to intake air.
- C. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.
 - 1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.
 - 2. Motor Controllers: Full-voltage, combination-magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.
 - 3. Control Voltage: 120-V ac or less, using integral control power transformer.

4. Motor Overload Protection: Overload relay in each phase.
 5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
 6. Automatic control switches to alternate lead-lag air compressors for duplex and air compressors.
 7. Instrumentation: Include discharge-air and receiver pressure gages, air-filter maintenance indicator, hour meter, air-compressor discharge-air and coolant temperature gages, and control transformer.
- D. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
1. Pressure Rating: At least as high as highest discharge pressure of connected air compressors (200 PSI minimum) and bearing appropriate code symbols.
 2. Exterior Finish: Epoxy coating.
 3. Accessories: Include safety valve, pressure gauge, automatic drain, and pressure regulator.

PART 2 - PRODUCTS

2.1 COMPRESSOR, AIR, SCREW, ROTARY, DUPLEX 10 HP (X2), HORIZONTAL RECEIVER, WITH INTEGRAL AIR DRYER

Equipment Identifier: 8082

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

Manufacturer	City	State	Phone
KAESER COMPRESSORS	FREDERICKSBURG	VA	(540) 898-5500
Model No.: DUPLEX SM10 AIRCENTER			

a. Reference details on Service Equipment Drawings

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 QUINCY	BAY MINNETTE	AL	(251) 937-5900
ALT #2 INGERSOLL RAND	DAVIDSON	NC	(704) 655-4000

- B. General Description: Provide duplex compressor package consisting of two single stage, fluid-injected, air-cooled rotary screw compressors completely pre-piped with pre-wired control system panel. Provide refrigerated dryer with moisture separator and automatic condensate drain. Provide package pre-mounted on receiver tank with moisture separator and automatic condensate drain.

C. Capacities/Dimensions:

1. Overall dimensions:

Overall Dimensions		
Length	Width	Height
85"	36"	67 3/4"
Weight		Capacity
1593 lb		0 lb

2. Boltdown dimensions:
 - a. Length: 42-1/4 inches
 - b. Width: 26-1/2 inches
 3. Motors: 10 HP
 4. Rating: 160 PSIG
 5. Speed: 3,600 RPM
 6. Delivery: 74.2 CFM
 7. Temperature: Unit shall be suitable for use in a 40 to 110 degree F ambient temperature range.
 8. Output valve: 3/4 inch NPT
- D. Features/Performance/Construction:
1. Compressor construction:
 - a. Unit shall be completely enclosed with a steel frame.
 - b. Unit shall have doors or access panel with safety interlock switches.
 2. Airend(s):
 - a. Compressor shall be fitted with an air inlet filter rated at 1 micron or better.
 - b. Rotors shall be made from cast iron. Airend drive shaft shall be tapered for easy removal of airend pulley.
 - c. Airend casing shall be cast iron construction.
 - d. Airend rotors shall be supported on both ends by cylindrical roller bearings.
 3. Drive:
 - a. Motor shall have TEFC enclosure.
 - b. Motor winding shall be 100 percent copper.
 - c. Compressor drive shall be multi V-belt drive and drive shall include automatic V-belt tensioning device with visual adjustment indicator. Belt shall be 100 percent oil-resistant.
 4. Lubrication/cooling system:
 - a. Compressor shall have a differential pressure fluid circulation system. Compressor shall be factory filled with semi-synthetic or full synthetic lubricant.
 - b. Fluid filter shall be rated for particles down to 10 microns.
 - c. Fluid coolers and aftercoolers shall be accessible for maintenance. Air cooled aftercooler and fluid cooler shall be integrally mounted to the compressor enclosure.
 - d. The aftercooler shall include an integral moisture separator of stainless steel construction with automatic condensate drain.
 - e. Compressor shall have an ASME separator tank with integral fluid separator element and a minimum of 217 PSIG working pressure.
 5. Compressor shall start and automatically load if system demands. Compressor shall have adjustable time delay to shut down the compressors after running unloaded for a pre-determined period of time.
- E. Controls and Instrument Panel:
1. Instrument panel shall have Sigma Control basic system or an approved equal. Control system shall be suitable for use in a 4 degree F to 140 degree F ambient temperature range. Control system shall meet or exceed NEMA12 standards for environmental protection. Control system shall monitor direction of rotation, discharge pressure, emergency stop button, airend discharge temperatures, motor overload relay.
 2. Pressure switch to cut in at 115 PSI and cut out at 160 PSI.
 3. Compressor shall shut down in the event of a motor overload, high airend temperature, incorrect rotation or loss of drive.
- F. Accessories:

Description	Manufacturer	Model No.	Qty.
OIL/WATER SEPARATOR	KAESER COMPRESSORS	KCF-50	1

G. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
208	3	10	26.00	DISCONNECT
208	3	10	26.00	DISCONNECT
115	1	0	3.40	DISCONNECT

H. Finish: Durable powder coat in manufacturer's standard color.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Check equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

- A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.
- B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 3. Anchorage: Attach equipment as detailed or directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces. Install compressed-air equipment to allow maximum headroom unless specific mounting heights are indicated.
 4. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
 5. Install equipment to allow right of way for piping installed at required slope.
 6. Install the following devices on compressed-air equipment:
 - a. Thermometer, Pressure Gauge, and Safety Valve: Install on each compressed-air receiver.
 - b. Pressure Regulators: Install downstream from air compressors, dryers, and filter assemblies.
 - c. Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor drain.
- C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve(s) if required.
- D. Connect piping to equipment with moving parts, except safety relief valve connections, with flexible connectors of materials suitable for service.
- E. Connect compressed air and fluid tappings with shutoff valve and union or flange at each connection.
- F. Install piping from safety relief valves to nearest floor drain.
- G. Install electrical devices furnished with equipment but not specified to be factory mounted.
- H. Ground equipment according to Division 26.
- I. Install control wiring, in conduit, to field-mounted electrical devices. Connect wiring according to Division 26.

3.4 IDENTIFICATION

- A. Identify compressed-air equipment system components. Comply with requirements for identification specified in Division 22.

3.5 CLEANUP

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative for final acceptance.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check for lubricating oil in lubricated-type equipment.
 - 3. Check belt drives for proper tension.
 - 4. Verify that air-compressor inlet filters and piping are clear.
 - 5. Check for equipment vibration-control supports and flexible pipe connectors and verify that equipment is properly attached to substrate.
 - 6. Check safety valves for correct settings. Ensure that settings are higher than air-compressor discharge pressure, but not higher than rating of system components.
 - 7. Check for proper seismic restraints.
 - 8. Drain receiver tank(s).
 - 9. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 10. Test and adjust controls and safeties.
- B. Prepare written report documenting testing procedures and results.

3.7 TESTING

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Startup and testing report shall be submitted to the Architect or designated representative.

1. Replace damaged and malfunctioning controls and equipment.
2. Test and adjust controls and safeties.
3. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures used.
 - c. Test methods used.
 - d. Results of tests.
- B. Components shall be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.8 TRAINING

- A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
 1. 8082 Compressor, air, screw, rotary, duplex 10 hp (x2), horizontal receiver, with integral air dryer; 2 hours (minimum)
- B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.
- C. Provide a Windows compatible movie file format recording on DVD disk of the training session. The DVD training movie can be of a live session or a produced training video.

END OF SECTION 11 11 13

SECTION 11 11 29 - VEHICLE SHOP EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 2040 Charger, battery, portable (Ref. Part 2.1)
 - 2. 2070 Recovery unit, refrigerant, R134A, portable (Ref. Part 2.2)
 - 3. 2165 Jack, floor, five ton (Ref. Part 2.3)
 - 4. 2200 Hoist, engine, 6000 pound, portable (Ref. Part 2.4)
 - 5. 2765 Torch, oxyacetylene, with cart (Ref. Part 2.5)
 - 6. 2770 Screen, welding (Ref. Part 2.6)
 - 7. 2835 Vise, 5-1/2 inch (Ref. Part 2.7)
 - 8. 3085 Cabinet, abrasive blast, with dust collector (Ref. Part 2.8)
- B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.
- C. Piping, wiring, and switching between equipment and utilities.

1.3 QUALITY ASSURANCE

- A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
- B. Manufacturer's Representative:
 - 1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
 - 2. Training: Provide technical representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
 - 2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- B. Operations and Maintenance Manual:
 - 1. Submit Operations and Maintenance Manuals in accordance with Division 1 - General Requirements of these specifications.
 - 2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
 - 3. Description of system and components.
 - 4. Schematic diagrams of electrical, plumbing, and compressed air system.
 - 5. Manufacturer's printed operating instructions.

6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.

- C. Shop Drawings:
 1. Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.
 2. Submit site specific installation drawings and procedures.

1.5 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

- A. Warrant work specified herein for one year from final acceptance against defects in materials, functions, and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. All parts shall be readily available locally in the United States.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.
- C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.8 LABELING

- A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.
- B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 CHARGER, BATTERY, PORTABLE

Equipment Identifier: 2040

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
CLORE AUTOMOTIVE	LENEXA	KS	(913) 310-1050
Model No.: SOL4745			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 SCHUMACHER ELECTRIC CORPORATION	MOUNT PROSPECT	IL	(800) 628-5485
ALT #2 ASSOCIATED EQUIPMENT CORPORATION	ST. LOUIS	MO	(314) 679-2544

B. Capacities/Dimensions:

1. Overall dimensions:

Overall Dimensions		
Length	Width	Height
10 3/4"	12"	40"
Weight		Capacity
42 lb		0 lb

2. DC out rating: 12 and 24 VDC
3. Charging capacity: One battery recommended
4. Charge rates:
 - a. 40 A 12 V fast charge rate
 - b. 10 A 12 V medium charge rate
 - c. 2 A 12 V low charge rate
 - d. 20 A 24 V fast charge rate
 - e. 2 A 24 V low charge rate
5. Shipping weight: 42 pounds

C. Features/Performance/Construction:

1. Cabinet: Unit shall be enclosed in bonderized steel cabinet with reinforced frame and gasketed access panel, suitable for permanent installation, including wall mounting.
2. Charger shall be equipped with an LCD display. LCD display shall have a backlight.
3. Charging rate controls:
 - a. Manual: Shall include set specific charging parameters and duration for up to two hours.
 - b. Automatic: Multi-phase charging sequence shall provide optimal charge.
 - c. Boost: Shall provide engine starting assistance to boost or jump start vehicles.
4. Transformers: Unit transformers shall be isolated and convection cooled.
5. Unit shall have 500 Amp 12V Carbon Pile battery tester: Clore No. 1874.

- D. Controls: Circuit breaker protection shall be integral with ON/OFF rocker switch.

E. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	0	15.00	STANDARD GROUNDED RECEPTACLE

F. Finish: Durable enamel in manufacturer's standard color

2.2 RECOVERY UNIT, REFRIGERANT, R134A, PORTABLE

Equipment Identifier: 2070

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

Manufacturer	City	State	Phone
ROBINAIR	WARREN	MI	(800) 533-6127
Model No.: COOL-TECH 34988 NI			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 YELLOW JACKET	BLOOMINGTON	MN	(952) 943-1300
ALT #2 MASTERCOOL INC.	RANDOLPH	NJ	(973) 525-9119

B. Capacities/Dimensions:

1. Overall dimensions, capacity, and weight:

Overall Dimensions		
Length	Width	Height
36"	24"	56"
Weight		Capacity
161 lb		0 lb

2. Operating range: 50 to 122 degrees F
3. Source tank: 30 pounds
4. Recycling filter drier: 43 cubic inches
5. Scale resolution: 1/100 pounds
6. Air displacement: 1.5 cubic feet per minute
7. Filter capacity: 150 pounds

C. Features/Performance/Construction:

1. Recovery unit shall be designed for systems using medium or high pressure refrigerants, including R-134A.
2. Unit shall recover, recycle, evacuate, perform leak tests, and recharge R-134a.
3. Unit shall be fully compliant with SAE J2788 standards
4. Unit shall be equipped to provide a fully automatic recovery, vacuum, leak test, and charge program.
5. Unit shall include automatic UV dye injection system.

6. Automatic oil measure and inject: The unit shall automatically determines how much lubrication oil needs to be injected back into the A/C system based upon how much oil was taken out during recovery.
 7. A/C system flush: Unit shall flush a vehicle's A/C system with refrigerant, eliminating a residual oil or other liquid.
 8. Unit shall include a date.
 9. Save and print service function: Information shall be organized by vehicle before and after service. Standard on-board printer shall be able to print service date to users.
 10. Indicator light and notification alarms:
 - a. Oil inject: Less than 1 percent cross-contamination
 - b. Refrigerant and oil database includes A/C charge and oil capacities for North American market vehicles.
 - c. Vacuum leak test: Unit shall monitor levels after evacuation and inform of possible leak.
 - d. Automatic air purge: Eliminates air in system without monitoring gauges or opening valves.
 - e. Automatic refrigerant refill: Maintains a user selectable amount of refrigerant in an internal vessel and signals when it is time to change supply tank. No monitoring required.
 - f. Vacuum feature: Default to 15 minutes, programmable to 99 minutes. "Remaining Time" shall be displayed.
 - g. Refrigerant charging: Unit shall allow for Select a charge mode from high side, low side, or both.
 - h. Refrigerant management system: Unit shall display refrigerant use and monitors remaining filter life. Prompts shall appear when 1/3 of filter life remains.
- D. Controls: High pressure shut-off switch.
- E. Accessories:

Description	Manufacturer	Model No.	Qty.
THERMAL PAPER (THREE ROLLS)	ROBINAIR	34214	1

- F. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	0	5.00	RECEPTACLE

2.3 JACK, FLOOR, FIVE TON

Equipment Identifier: 2165

- A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
NORCO INDUSTRIES	COMPTON	CA	(310) 639-4000
Model No.: 71500G			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 GRAY	JOSEPH	MO	(800) 821-7320
ALT #2 OTC TOOLS	WARREN	MI	(800) 533-6127

B. Capacities/Dimensions:

1. Dimensions:

Overall Dimensions		
Length	Width	Height
62 1/4"	16 3/4"	47 7/8"
Weight		Capacity
270 lb		10000 lb

- Length of handle: 40 inches
- Low lift height: 5-5/8 inches
- High lift height: 27-1/4 inches
- Height of chassis: 7-7/8 inches

C. Features/Performance/Construction:

- Jack shall have chromed ram and dust seals to prevent hydraulic contamination.
- Jack shall have safety bypass and overload systems to prevent cylinder damage and prevent usage beyond ASME/PASE load - limiting standard.
- Side plates shall be steel construction.
- Jack shall have spring-loaded "T" handle
- Base shall be of steel construction

D. Finish: Durable enamel in manufacturer's standard colors.

2.4 HOIST, ENGINE, 6,000 POUND, PORTABLE

Equipment Identifier: 2200

A. Manufacturer's Reference:

- Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
AFF EQUIPMENT Model No.: AFF3584	ELGIN	IL	(800) 323-7402

- Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 VESTIL-EQUIPMENT	DONALD	OR	(800) 338-1382
ALT #2 OTC	WARREN	MI	(800) 533-6127

B. Capacities/Dimensions:

1. Overall dimensions:

Overall Dimensions		
Length	Width	Height
26"	38"	61 1/2"
Weight		Capacity
359 lb		6000 lb

2. Lifting Capacity: 6,000 lbs.
3. Low Pick Up height: 34 inches
4. High Lifting Point: 82 inches
5. Stand weight: 359 pounds

C. Features/Performance/Construction:

1. Boom setting shall have a minimum capacity of 2,000 pounds at tallest setting.
2. Hoist legs shall be adjustable from 23 inches to 28-1/2 inches.
3. Rear casters shall be swivel type 4-1/4 inch. Front casters shall be fixed six inch.
4. Hydraulic ram shall have a 12 ton capacity. Ram shall be provided with a safety overload feature.

D. Finish

1. Durable enamel in manufacturer's standard color.

2.5 TORCH, OXYACETYLENE, WITH CART

Equipment Identifier: 2765

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
HARRIS PRODUCT GROUP	MASON	OH	(800) 733-4043
Model No.: 4403235			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 ESAB	DENTON	TX	(800) 426-1888
ALT #2 UNI WELD PRODUCTS INC	FORT LAUDERDALE	FL	(954) 584-2004

B. Capacities/Dimensions:

1. Overall cart dimensions:

Overall Dimensions		
Length	Width	Height
28"	16 1/2"	43 1/2"
Weight		Capacity
54.5 lb		0 lb

2. Weight: 54-1/2 pounds
3. Maximum Oxygen Cylinder diameter: 9-1/4 inches

4. Maximum Acetylene Cylinder diameter: 10-1/2 inches
 5. Wheel size: 14 inch diameter, 1-3/4 inch wide
 6. Base Plate: 9 inches wide, 21 inches long
 7. Bracket Chain height: 27 inches
 8. Capacity:
 - a. Cuts to 1 inch plate
 - b. Welds to 1/8 inch plate
- C. Features/Performance/Construction:
1. Materials: Welder shall have a rugged brass torch handle with positive balance and in-lined stainless steel tube design. Cutting attachment head shall be constructed of solid forged brass.
 2. Torch shall be equipped with internal reverse flow check valves.
 3. Regulators shall have 2 inch dual scale gauges.
 4. Torch kit shall be able to cut up to a 1 inch thickness and weld up to a 1/2 inch thickness.
 5. The torch kit shall include the following standard equipment:
 - a. Shade No. 5 protective goggles
 - b. Brass welding handle: Harris No. 43-2, one each
 - c. Cutting head attachment: Harris No. 73-3, one each
 - d. Mixer: Harris No. E-43, one each
 - e. Regulators with gauges:
 - 1) Fuel: Harris No. 425-15-510, one each
 - 2) Oxygen: Harris No. 425-125-540, one each
 - f. Welding head attachment: Harris No. 23A90-5 Oxy-Acet, one each
 - g. Cutting tip: Harris No. 6290-1AC Oxy-Acet, one each
 - h. Dual Supply Hose: 20 feet long Harris No. 4300683, one each
 - i. Striker: One each
- D. Finish: Durable enamel in manufacturer's standard color.

2.6 SCREEN, WELDING

Equipment Identifier: 2770

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
SINGER SAFETY COMPANY	CHICAGO	IL	(773) 235-2100
Model No.: 12A33447			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 GLOBAL INDUSTRIAL	PORT WASHINGTON	NY	(888) 978-7759
ALT #2 JOHN TILMAN COMPANY	COMPTON	CA	(800) 255-5480

B. Capacities/Dimensions:

1. Overall dimensions, capacity, and weight:

Overall Dimensions		
Length	Width	Height
144"	18"	72"
Weight		Capacity
46.5 lb		0 lb

2. Screen Frame height: 75 inches
3. Weight, nominal: 46.5 pounds

C. Features/Performance/Construction:

1. Screen: Slip-on, one piece screen shall be provided
 - a. Material: Screen material shall be vinyl coated fabric
 - b. Color: Screen color shall be green
2. Frame shall be 18 gauge steel with durable powder coat.
3. Panels shall be joined together with minimum of two hinges between each panel
4. Casters:
 - a. Four casters shall be provided per each screen (12 total)
 - b. Casters shall be 2 inches in diameter and be constructed of plastic.
 - c. Casters shall bolt through the screen frame.

2.7 VISE, 5-1/2 INCH

Equipment Identifier: 2835

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
WMH TOOL GROUP / WILTON	LA VERGNE	TN	(800) 274-6848
Model No.: 28827			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 MILWAUKEE TOOL	MILWAUKEE	WI	(800) 729-3878

B. Overall Capacities/Dimensions/Weights:

1. Overall dimensions, weight, and capacity:

Overall Dimensions		
Length	Width	Height
9"	18"	10"
Weight		Capacity
109 lb		0 lb

2. Jaw width: 5 inches
3. Opening capacity max: 7-7/8 inches

4. Throat depth: 5-1/2 inches
 5. Pipe jaw capacity: 3/8 inches to 4-1/2 inches
- C. Features/Performance/Construction:
1. Base shall swivel 360 degrees and have locking device.
 2. Construction shall be ductile-iron cast body and with a tensile strength of 60,000 PSI.
 3. Jaws shall have replaceable facings.
 4. Precision side bar shall be keyed for a 0.003 inch fit.

2.8 CABINET, ABRASIVE BLAST, WITH DUST COLLECTOR

Equipment Identifier: 3085

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

Manufacturer	City	State	Phone
TRINITY TOOL COMPANY (TRINCO)	FRASER	MI	(800) 587-4626
Model No.:	MODEL 36 WITH BP DUST COLLECTOR		

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 LARRY HESS AND ASSOCIATES	SALISBURY	NC	(800) 535-2612
ALT #2 TITAN ABRASSIVE SYSTEMS	IVYLAND	PA	(215) 310-5055

B. Capacities/Dimensions:

1. Overall dimensions, weight, and capacity:

Overall Dimensions		
Length	Width	Height
65"	25"	64"
Weight		Capacity
340 lb		0 lb

2. Cabinet:
 - a. Dimensions:
 - 1) Length: 38 inches
 - 2) Width: 25 inches
 - 3) Height: 64 inches
3. Dust collector:
 - a. Motor: 18,000 RPM
 - b. Vacuum rating: 100 CFM
 - c. Dust collection capacity: 3 gallons
 - d. Dimensions:
 - 1) Diameter: 15 inches
 - 2) Height: 55 inches

C. Features/Performance/Construction:

1. Media type: Unit shall utilize glass bead and sand for dry blast media.
2. Cabinet: Blast cabinet shall be fabricated of 14-gauge welded steel.
3. Gloves: Heavyweight rubber gloves shall be attached to 6-inch armhole ports, two each.
4. Viewing window: Safety glass window shall be easily removable by loosening window frames.
5. Lighting: Interior cabinet lighting shall be provided with fluorescent tubes.
6. Air system: Unit shall be equipped with air pressure regulator and gauge.
7. Doors:
 - a. Flip up top: Unit shall provide one flip up top door.
 - b. Side: Unit shall provide one side door.
8. Dust collector:
 - a. Construction: Dust collector shall be fabricated of 14-gauge steel.
 - b. Motor: Unit shall be equipped with motor and impeller on clean air side.
 - c. Filter bags: Unit shall utilize filter bags with 8 square feet of total surface area.
9. Orifice: Standard equipment for suction feed type media gun shall include a 5/16-inch inside diameter orifice.
10. Blow off: Unit shall be provided with a pushbutton controlled valve at the media gun.
11. Nozzle: 5/16 ID tungsten carbide with 25 cfm blast gun
12. Nozzle mount bracket: Unit shall be provided with bracket for nozzle.
13. Foot valve: Blasting control shall be provided by spring actuated two-way air foot valve.
14. Floor: Unit shall be equipped with 1/8-inch expanded steel grate on top of a fine mesh steel carbon screen.
15. Replacement filter bags: Trinco No. 2-30 (six each)
16. Replacement nozzle: Trinco No. 2-71 (one each)
17. Clean air blow off gun: Trinco No. 2-55 (one each)
18. Nozzle mounting bracket: Trinco No. 4-42 (one each)
19. 3/8-inch regulator with gauge

D. Controls: ON/OFF toggle switch for lighting and dust collector. Electrical controls and switching shall meet all National Electrical Code requirements.

E. Accessories:

Description	Manufacturer	Model No.	Qty.
EXTRA BRIGHT LED LIGHTING UPGRADE (ONE EACH)	TRINCO	2-00382	1
18 INCH DIAMETER, 300 POUND CAPACITY STATIONARY TURNTABLE (ONE EACH)	TRINCO	1-71800	1
UNDERLAYMENT CLEAR MYLAR SHEETS (10 SHEETS PER RACK)	TRINCO	2-00192	1
TRIN MIX #4 (50 POUNDS, ONE EACH)	TRINCO	302-004	1
TRIN MIX #2 (50 POUNDS, ONE EACH)	TRINCO	302-002	1
TRIN BEADS #8 (50 POUNDS, ONE EACH)	TRINCO	301-008	1
TRIN BEADS #50 (50 POUNDS, ONE EACH)	TRINCO	300-0050	1

F. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
115	1	1	9.00	RECEPTACLE

PLUMBING			
Domestic Water			
Connection (IN)	Flow Rate(CFM)		Capacity (PSI)
Natural Gas			
Connection (IN)	Capacity (BTU/Hr)	Pressure (PSI)	
		Minimum	Maximum
Compressed Air			
Connection (IN)	Flow Rate (CFM)	Pressure (PSI)	
		Minimum	Maximum
3/8"	25.00	50.00	100.00 psi

- G. Finish: Durable enamel in Owner's choice of manufacturer's standard color

PART 3 - EXECUTION

3.1 INSPECTION

- Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- Inspect delivered equipment for damage from shipping and exposure to weather.
- Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items.

3.2 INSTALLATION

- Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.
- Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
 - Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
 - Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 - Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
- Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

- After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

- Touch-up damage to painted finishes.

- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.5 TRAINING

- A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
 - 1. 2040 Charger, battery, portable; 1 hours (minimum)
 - 2. 2070 Recovery unit, refrigerant, R134A; 0.50 hours (minimum)
 - 3. 2765 Torch, oxyacetylene, with cart; 1 hours (minimum)
- B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 29

SECTION 11 24 19 - VACUUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 3280 Extractor, fume, welding, portable, 800 CFM (Ref. Part 2.1)
 - 2. 3464 Reel, vehicle exhaust, spring operated, individual fan, six inch hose (Ref. Part 2.2)
- B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.
- C. Piping, ductwork, wiring, and switching between equipment and utilities.

1.3 QUALITY ASSURANCE

- A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
- B. Manufacturer's Representative:
 - 1. Installation: Provide a qualified manufacturer's representative at site to perform work related to equipment installation, check out and start up.
 - 2. Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

1.4 SUBMITTALS

- A. Product Data: Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- B. Operations and Maintenance Manual:
 - 1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
 - 2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
 - 3. Description of system and components.
 - 4. Schematic diagrams of electrical, plumbing, and compressed air system.
 - 5. Manufacturer's printed operating instructions.
 - 6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.
- C. Shop Drawings: Submit Shop Drawings in accordance with Division 1 - General Requirements of these specifications.

1.5 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.

- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

- A. Warrant work specified herein for one year from final acceptance by Owner against defects in materials, function and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. All parts must be readily available locally in the United States.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and in humid, dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title of this specification.
- C. Provide equipment with materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.8 LABELING

- A. Manufacturer will securely attach in a prominent location on each major item of equipment a noncorrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.
- B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 EXTRACTOR, FUME, WELDING, PORTABLE, 800 CFM

Equipment Identifier: 3280

- A. Manufacturer's Reference:
 - 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
AIRFLOW SYSTEMS, INC.	DALLAS	TX	(214) 503-8008
Model No.: PCH-1 WITH ACCESSORIES			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 PLYMOVENT	CRANBURY	NJ	(800) 644-0911
ALT #2 AMERICAN AIR FILTER INTERNATIONAL	LOUISVILLE	KY	(800) 477-1214

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
24"	37"	91 1/4"
Weight		Capacity
255 lb		0 lb

2. Motor: 1-1/2 HP
3. Air flow:
 - a. Minimum: 600 CFM
4. Coverage: Arc of 360 degrees and 10 foot radius
5. Weight, nominal: 255 pounds
6. Drawer capacity: 5 gallons
7. Tube diameter: 7 inches, nominal
8. Cabinet dimension height: 3 inches

C. Features/Performance/Construction:

1. Unit hose arm shall be equipped with friction release joint adjustment for positioning. The hose shall be a 7 inch diameter flexible hose attached to an aluminum alloy pick-up hood.
2. Unit shall be equipped with two 8 inch casters in front and two 4 inch casters in back, and a handle for portability.
3. Unit shall be equipped with a removable panel for service and pull out drawer in base for dust removal.
4. Unit power supply shall be equipped with three prong plug on 25 foot, 12 gauge power cord.
5. Cabinet of unit shall be low profile to provide a low center of gravity.
6. Filter unit shall be constructed of 16 gauge welded steel.

D. Controls: ON/OFF power switch

E. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	1.5	15.00	RECEPTACLE

F. Finish: Powder coated in manufacturer's standard color.

2.2 REEL, VEHICLE EXHAUST, SPRING OPERATED, INDIVIDUAL FAN, WITH SIX INCH HOSE

Equipment Identifier: 3464

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
NEDERMAN	CHARLOTTE	NC	(704) 399-7441
Model No.: 865 W/ ACCESSORIES			

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in Section 01300 SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 PLYMOVEMENT	CRANBURY	NJ	(609) 395-3500
ALT #2 MONOXIVENT	ROCK ISLAND	IL	(309) 794-1000

B. Overall Capacities/Dimensions/Weights:

1. Overall reel dimensions:

Overall Dimensions		
Length	Width	Height
60"	35"	33"
Weight		Capacity
150 lb		0 lb

2. Exhaust hose:
 - a. NFC 4.2: 6 inches, 24 feet, 800 degrees
 - b. NFC 6.5: 6 inches, 8 feet, 1200 degrees
3. Drum storage capacity hose length: 29 feet, 6 inches

C. Features/Performance/Construction:

1. Exhaust hose drum:
 - a. The exhaust hose drum, Nederman Model No. 20804865 shall consist of an aluzinc-lined metal cylinder bolted to two metal ends. Inside the drum there is a flexible 6-1/4 inch pipe which links the hose and the swivel.
 - b. The stand shall consist of two aluzinc-lined supports and two aluzinc-plated steel tubes.
 - c. The hose guide shall guide the hose on the first evolution of the drum.
 - d. The connecting tube of aluminum, flexible, 6-1/4 inch diameter, 12 inch length, shall be used in a straight position when bends are needed in the duct system.
2. Exhaust fan:
 - a. Each exhaust hose reel shall have an individual exhaust fan which shall be mounted to the ceiling or wall. The exhaust fan shall be Nederman series N24, No. 14511022
 - b. Exhaust fan shall be centrifugal type fan constructed of powder coated steel.
 - c. The exhaust fan shall be mounted to ductwork utilizing a fan mounting bracket, Nederman Model No. 20373556
3. Exhaust hose
 - a. The hose shall be constructed of high temperature fabric with an external steel helix. The steel helix shall have a plastic coating to prevent it from scratching vehicles.
 - 1) First eight feet shall be resistant to temperatures up to 1,200 degrees Fahrenheit. NFC 6.5 Nederman model No. 20824462.

- 2) Second 24 feet shall be resistant to temperatures of up to 800 degrees F, NFC 4.2 Nederman Model No. 86900692.
- b. The two hose sections shall be connected using Nederman 6 inch hose coupling, No. 20948810
4. Hose stop Nederman Model No 20344476 shall be adjustable so that the hose will hang at any required height.
- D. Controls:
 1. Exhaust fan shall be wall mount fan starter with on/off switch. Nederman Model No 20373557 with control box Nederman Model No. 89115570.
- E. Accessories:

Description	Manufacturer	Model No.	Qty.
EXTRACTION NOZZLE WITH CLAMP	NEDERMAN	20804761	1
EXTRACTION NOZZLE WITH LIFTING SLEEVE	NEDERMAN	20816661	1
TELESCOPING POLE	NEDERMAN	20374287	1
STAINLESS STEEL NOZZLE, 6 INCH	NEDERMAN	89298067	1

1. Nozzle shall be capable of withstanding temperatures of 1,200 degrees Fahrenheit (minimum).
2. Nozzle shall be equipped with a hook for telescopic lifting pole and a vise grip. Nozzle shall have a steel mesh inlet to prevent debris from entering the hose.
- F. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
120	1	1	11.40	J-BOX

Mechanical					
Flue		Exhaust			
Size (IN)	Pressure (PSI)	Width (IN)	Height (IN)	Diameter (IN)	Flow (CFM)
		3"	30"	6"	883

PART 3 - EXECUTION

3.1 INSPECTION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping and exposure to weather.
- C. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.2 INSTALLATION

- A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.
- B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:
 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment securely to floor, as directed by Architect or designated representative, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 CLEANING

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.4 TESTING

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.5 TRAINING

- A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
 1. 3280 Extractor, fume, welding, portable, 800 CFM; 1 hours (minimum)
 2. 3464 Reel, vehicle exhaust, spring operated, individual fan, six inch hose; 2 hours (minimum)
- B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 24 19

SECTION 113100 - RESIDENTIAL AND COMMERCIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Microwave.
 - 2. Refrigerator/Freezer.
 - 3. Ice Cube Machine.
- B. Related Sections:
 - 1. Division 22 Section "Plumbing Pipe and Fittings" for water distribution piping connections and drainage and vent piping connections to appliances.
 - 2. Division 26 Section "Wiring Devices" for services and connections to appliances.

1.3 SUBMITTALS

- A. Product Data: For each type of appliance, from manufacturer. Include operating characteristics, dimensions of individual appliances, required operating and installation clearances, and finishes for each appliance.
- B. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.
- C. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain residential appliances from single source manufacturer.
- B. Regulatory Requirements: Comply with the following:
 - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
 - 3. NAECA: Provide residential appliances that comply with NAECA standards.
 - 4. AHRI: Provide commercial appliances that comply with AHRI standards.
 - 5. NSF/ASI: Provide commercial appliances that comply with applicable NSF/ASI standards.

- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", ICC/ANSI A117.1, and the North Carolina State Building Code.
- D. Pre-Installation Conference: Conduct conference at Project site.

1.5 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
- B. Microwave Oven: Limited warranty for factory specified parts and repair labor to correct defects in material or workmanship.
 - 1. Warranty Period: One year from date of Final Acceptance.
- C. Refrigerator/Freezer: Limited warranty for factory specified parts and repair labor to correct defects in material or workmanship.
 - 1. Warranty Period: One year from date of Final Acceptance.
- D. Ice Machine: Limited warranty for factory specified parts and repair labor to correct defects in material or workmanship.
 - 1. General Warranty Period: Three years from date of Final Acceptance.
 - 2. Special Warranty Period-Evaporator: Five years from date of Final Acceptance.
 - 3. Special Warranty Period-Compressor: Five-year limited warranty for parts and three-year limited warranty for labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Residential appliances have been based on products by **General Electric Company**. Provide the selected products, or comparable products by one of the following:
 - 1. Amana Appliances.
 - 2. Hotpoint.
 - 3. Whirlpool Corporation.
- B. Basis of Design: Commercial ice cube machine has been based on product by **Manitowoc Foodservice**. Provide the selected product, or comparable product by one of the following:
 - 1. Scotsman Industries
 - 2. Hoshizaki America, Inc.
 - 3. KD Industries, Inc.

2.2 MICROWAVE OVEN

- A. Basis of Design Product: General Electric Model JES1657SMSS

1. Type: Countertop Microwave Oven
2. Oven Capacity: 1.6 Cu. Ft.
3. Oven Features:
 - a. Controls: Digital control panel with timer display.
 - b. Mounting: Countertop.
 - c. Microwave Power Rating: 1,150 W.
 - d. Oven Door: Oven door with glass view window.
 - e. Appliance Color/Finish: Stainless steel.
 - f. Other Features: Turntable and incandescent work surface light.

2.3 REFRIGERATOR/FREEZERS

- A. Basis of Design Product: General Electric Model PYE22KYNFS
1. Type: Freestanding, French door, bottom mount refrigerator (ADA Compliant).
 2. Storage Capacity: 22.2 Cu. Ft.
 - a. Fresh Food Compartment Volume: 15.0 Cu. Ft.
 - b. Freezer Compartment Volume: 7.2 Cu. Ft.
 - c. Shelving Area: One adjustable partial-width, one fixed full-width, and three adjustable half-width with spill proof glass shelves.
 - d. Refrigerator Features:
 - 1) Compartment Storage: Two humidity-controlled crispers, one temperature-controlled crisper, and one non-temperature controlled crisper.
 - 2) Door Storage: Three adjustable gallon shelves and three fixed full width shelves.
 - 3) Lighting: Interior light in each compartment.
 - 4) Filtration and Dispensing: Exterior filtered water, factory installed ice maker.
 - e. Energy Consumption: Measured and certified by AHAM HRF-1 at not more than 515 kWh/year under average conditions for a volume of 26 Cu. Ft.
 - f. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
 - g. Temperature Controls: Tap touch electronic controls.
 - h. Appliance Color/Finish: Stainless steel.

2.4 ICE CUBE MACHINE

- A. Basis-of-Design Product: Manitowoc Indigo NXT Ice Cube Machine iT0450, Model IYT0450A-161.
1. Type: Commercial Air-Cooled Half-Dice Ice Machine.
 2. Ice Production: 50 Degree F water yields 490 lbs. 70 degree F water yields 378 lbs.
 3. Power Usage: 5.52 KWh/100 lbs. Ice.
 4. Power Requirements: 115v, 11.9 amps, 60 Hertz, 1 Phase.
 5. BTU Per Hour: 3,800 (average), 6,000 (peak).
 6. Refrigerant: R410A CFC-Free.
 7. Appliance Color/Finish: Stainless Steel with Clear Coat Finish
 8. Ice Cube Machine Features:
 - a. Intelligent Diagnostics: Provides 24-hour preventative maintenance and diagnostic check.

- b. Acoustical Ice Sensing Probe.
 - c. Electronic Illuminated Display.
 - d. Programmable Ice Production.
 - e. Hinged front door and removable water trough, distribution tube, curtain, and sensing probe for easy to clean food zone.
 - f. Corrosion resistant interior.
 - g. NSF Listed.
9. Accessories:
- a. Ice Storage Bin: Manitowoc Model B-570 with storage capacity of 430 AHR/lb. Adjustable stainless steel legs.
 - b. Primary Water Filter: Manitowoc Model AR-10000. Assembly includes head, shroud, hardware, mounting assembly, and one filter cartridge.
 - c. Pre-Filter: Manitowoc Model AR-PRE. Assembly includes head, shroud, hardware, mounting assembly, and one filter cartridge.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where microwave ovens with vented exhaust fans will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- 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 that 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: Comply with plumbing and electrical requirements.

3.3 FIELD QUALITY CONTROL

- A. Perform Tests and Inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- C. An appliance will be considered defective if it does not pass tests and inspections.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial appliances.

END OF SECTION 113100

SECTION 122413 - ROLLER WINDOW SHADES

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 manually operated roller shades.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
 - 1. Manually Operated Roller Shades
 - 2. Minimum Drawing Scale: 1/4 inch = 1 foot.
- C. Samples for Initial Selection: For each colored component of each type of roller shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches (400 mm) wide for each type of roller shade indicated.
 - 2. For the following products:
 - a. Shade Material: Not less than 12-inch (300-mm) square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
 - b. Fascia Panel: Not less than 4-inch square sample of fascia material.
- E. Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings (Refer to Keyed Notes K27 and K28 on Drawing Sheet A1-101 and Keyed Note K29 on Drawing Sheet A2-101).
- F. Product Certificates: For each type of roller shade product, signed by product manufacturer.
- G. Product Test Reports: For each type of roller shade product.

- H. Qualification Data: For Installer.
- I. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.
 - 4. Motorized shade operator.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- E. Corded Window Covering Product Standard: Provide roller shades complying with WCMA A 100.1.
- F. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Owner.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Building is currently occupied. Coordinate installation with owner to provide minimal disruption to building occupants.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances

REGION 1 HEADQUARTERS

for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed.

1.8 WARRANTY

- A. Furnish manufacturer's written non-depreciating warranty for manual operating roller shades.
 - 1. Shade Hardware and Operating Chain: ten (10) years
 - 2. Fabric/Shade Cloth: ten (10) years
 - 3. Aluminum and Steel Coatings: ten (10) years.
 - 4. Installation Warranty: one (1) year from final acceptance
- B. Submit manufacturer's standard maintenance contract for review by owner.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manually Operated Shade Hardware Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Draper Shade & Screen Co., Inc.
 - 2. Hunter Douglas Contract.
 - 3. MechoShade Systems, Inc.
 - 4. Nysan Shading Systems Ltd.
- B. Shade Band Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Draper Shade & Screen Co., Inc., Screen Nature.
 - 2. Hunter Douglas Contract, Greenscreen and SuperSol.
 - 3. MechoShade Systems, Inc., EcoVeil.
 - 4. Nysan Shading Systems Ltd., Greenscreen.

2.2 SHADE BAND MATERIAL

- A. Shade Band Material: PVC-Free

REGION 1 HEADQUARTERS

1. Material Width: As Required for each individual window. See floor plans.
2. Bottom Hem: Straight.
3. Material Openness Factor: 3% Openness.
4. Material Color: As selected by Architect from Manufacturer's Full Range.
5. Antimicrobial Performance: Capable of inhibiting growth of bacteria (ASTM G 21) and fungi (ASTM G 22).

2.3 ROLLER SHADES

- A. Rollers: Extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for multiple roller shade bands per roller as required to accommodate window sizes shown on drawings.
- B. Direction of Roll: Regular, from back of roller.
- C. Mounting Brackets: Galvanized or zinc-plated steel. Fascia end caps, fabricated from steel finished to match fascia or headbox.
- D. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.
- E. Top/Back Cover: L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside. Top/back cover not required where roller shades are attached to gypsum soffits, gypsum window head framing, or underside of light shelves.
- F. End Cap: Provide size compatible with roller size and fasteners appropriate for installation conditions. Material and finish to match fascia.
- G. Bottom Bar: Flat steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- H. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
 1. Position of Clutch Operator: Coordinate with Owner.
 2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 3. Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 4. Loop Length: Provide full length of roller shade in perimeter offices with light shelves. Provide length required to make operation convenient from floor level where necessary due to window size.
 5. Bead Chain: Stainless steel.
 6. Operating Function: Stop and hold shade at any position in ascending or descending travel.
- I. Shade Operation: Manual; with gear and crank lift operator.
 1. Position of Crank Operator: Coordinate with Owner.
 2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.

REGION 1 HEADQUARTERS

3. Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 4. Crank Handle: Detachable: Coordinate quantity with Owner.
 5. Length of Crank Handle: Length required to make operation convenient from floor.
 6. Shade Coupler System: Designed for simultaneous operating shade rollers with a single crank. Provide system for each group of shades where indicated on the drawings.
- J. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- K. Hold-Down Brackets and Hooks or Pins: Provide manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut on window shades mounted to exterior doors.
- L. Location:
1. Building 01-Administration Building: See Keyed Notes K27 and K28 on drawing sheet A1-101.
 2. Building 02-Maintenance Building: See Keyed Note K29 on drawing sheet A2-101.

2.4 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from Manufacturer's Full Range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 122413

SECTION 133419 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Structural-steel framing.
 - 2. Metal roof panels.
 - 3. Metal wall panels.
 - 4. Metal soffit panels.
 - 5. Thermal insulation air barrier system.
 - 6. Accessories.
- B. Related Requirements:
 - 1. Section 014100 "Special Inspections and Structural Testing" for inspection and testing requirements.
 - 2. Section 074213 "Formed Metal Wall Panels" for metal wall panels not included here.
 - 3. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface.
 - 4. Section 081113 "Hollow Metal Doors and Frames" for hollow metal doors in metal building systems.
 - 5. Section 083323 "Overhead Coiling Doors" for coiling vehicular doors in metal building systems.
 - 6. Section 084113 "Aluminum Entrances and Storefronts" for storefront construction in metal building systems.
 - 7. Section 089100 "Louvers" for louvers in metal building systems.
 - 8. Section 102226 "Manually Operated Acoustical Panel Partitions" for operable partitions to be supported by metal building structure (Administration Building Only).

1.3 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.
 - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
 - 2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
 - 3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Metal roof panels.
 - b. Metal wall panels.
 - c. Metal soffit panels.

- d. Thermal insulation and vapor-retarder facings.
 - e. Roof ventilators.
 - B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details, and the following:
 - 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 - 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 - a. Show provisions for attaching mezzanines.
 - 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
 - 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
 - C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Provide Manufacturer's color charts showing full range of colors available for each type of finish.
 - D. Samples for Verification: For the following products:
 - 1. Panels: Nominal **12 inches (300 mm)** long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 - 2. Flashing and Trim: Nominal **12 inches (300 mm)** long. Include fasteners and other exposed accessories.
 - 3. Vapor-Retarder Facings: Nominal **6-inch (150-mm)** square Samples.
 - 4. Accessories: Nominal **12-inch (300-mm)** long Samples for each type of accessory.
 - E. Delegated-Design Submittal: For metal building systems.
 - 1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Shop drawings and structural calculations shall be sealed and signed by a professional engineer registered in the State of North Carolina.
- 1.7 INFORMATIONAL SUBMITTALS**
- A. Qualification Data: For erector and manufacturer.
 - B. Welding certificates.

- C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 - 1. Name and location of Project.
 - 2. Order number.
 - 3. Name of manufacturer.
 - 4. Name of Contractor.
 - 5. Building dimensions including width, length, height, and roof slope.
 - 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - 7. Governing building code and year of edition.
 - 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 - 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 - 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
 - 11. 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.
- D. Erector Certificates: For qualified erector, from manufacturer.
- E. Material Test Reports: For each of the following products:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Non-shrink grout.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."

2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockups for typical wall metal panel including accessories.
 - a. Size: 48 inches (1200 mm) long by 48 inches (1200 mm).
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 25 years from date of Final Acceptance.

- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers which may be incorporated in the work include, but are not limited to, the following:
 - 1. ACI Building Systems, Inc.
 - 2. Alliance Steel Building Systems.
 - 3. Bigbee Steel Buildings, Inc.
 - 4. Butler Manufacturing Company.
 - 5. Ceco Building Systems.
 - 6. Dean Steel Buildings, Inc.
 - 7. Garco Building Systems.
 - 8. Inland Building Systems.
 - 9. Nucor Building Systems.
 - 10. Star Building Systems.
 - 11. Varco Pruden Buildings.
 - 12. Vulcan Steel Structures, Inc.
- B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of 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.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As indicated on Drawings and as required by the 2018 North Carolina State Building Code.

2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
- C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 1. Wind Loads: As indicated on Drawings.
- F. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- G. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- H. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- I. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- J. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 1. Uplift Rating: UL 90.
- K. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
- L. Hail Resistance: **SH**.
- M. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C1363 or ASTM C518:

1. Roof:
 - a. Assembly U-Factor: As indicated on Drawings.
 - b. Insulation R-Value: As indicated on Drawings.
2. Walls:
 - a. Assembly U-Factor: As indicated on Drawings.
 - b. Insulation R-Value: As indicated on Drawings.

2.4 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
 3. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
 4. Frame Configuration: Multiple gable and Single gable; as shown on Drawings.
 5. Exterior Column: Uniform depth or tapered.
 6. Rafter: Tapered.
- E. End-Wall Framing: Except where noted otherwise, Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
 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.
 2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum ~~2-1/2-inch~~ (64-mm-) wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum ~~2-1/2-inch~~ (64-mm-) wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 4. Flange Bracing: Minimum ~~2-by-2-by-1/8-inch~~ (51-by-51-by-3-mm) structural-steel angles or ~~1-inch~~ (25-mm-) diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 5. Sag Bracing: Minimum ~~1-by-1-by-1/8-inch~~ (25-by-25-by-3-mm) structural-steel angles.
 6. Base or Sill Angles: Manufacturer's standard base angle, minimum ~~3-by-2-inch~~ (76-by-51-mm), fabricated from zinc-coated (galvanized) steel sheet.
 7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 8. Framing for Openings: Channel shapes; fabricated from 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. Framing for Manually Operated Acoustical Panel Partitions: Manufacturer's standard sections fabricated to withstand required loads. Coordinate with loading requirements with the manually operated acoustical panel partition system manufacturer.
 10. 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.
- G. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.
1. Type: Tapered-beam, below-eave type and as indicated.
- H. Bracing: Provide adjustable wind bracing as follows:
1. Rods: ASTM A36/A36M; ASTM A572/A572M, Grade ~~50~~ (345); or ASTM A529/A529M, Grade ~~50~~ (345); minimum ~~1/2-inch~~ (13-mm-) diameter steel; threaded full length or threaded a minimum of ~~6 inches~~ (152 mm) at each end.
 2. Cable: ASTM A475, minimum ~~1/4-inch~~ (6-mm-) diameter, extra-high-strength grade, Class B, zinc-coated, seven-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: Fabricated 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: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

- I. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- J. Materials:
 - 1. W-Shapes: ASTM A992/A992M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
 - 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
 - 3. Plate and Bar: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
 - 4. Steel Pipe: ASTM A53/A53M, Type E or S, Grade B.
 - 5. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B or C, structural tubing.
 - 6. Structural-Steel Sheet: Hot-rolled, ASTM A1011/A1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A1008/A1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or HSLAS, Grades 45 through 70 (310 through 480).
 - 7. Metallic-Coated Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
 - 8. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, SS, Grade 50 or 80 (340 or 550); with Class AZ50 (AZM150) coating.
 - 9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563 (ASTM A563M) carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.
 - a. Finish: Plain.
 - 10. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - a. Finish: Plain.
 - 11. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (Grade A490M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
 - 12. Unheaded Anchor Rods: ASTM A572/A572M, Grade 50 (345).
 - a. Configuration: Straight.
 - b. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.
 - c. Plate Washers: ASTM A36/A36M carbon steel.
 - d. Washers: ASTM F436 (ASTM F436M) hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
 - 13. Headed Anchor Rods: ASTM F1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.

- c. Plate Washers: ASTM A36/A36M carbon steel.
 - d. Washers: **ASTM F436** (**ASTM F436M**) hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
14. Threaded Rods : **ASTM A572/A572M**, Grade **50** (**345**).
- a. Nuts: **ASTM A563** (**ASTM A563M**) heavy-hex carbon steel.
 - b. Washers: **ASTM F436** (**ASTM F436M**) hardened carbon steel.
 - c. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
- K. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
- 1. Clean and prepare in accordance with SSPC-SP2.
 - 2. Coat with manufacturer's standard primer where compatible with scheduled finishes. Apply primer to primary and secondary framing to a minimum dry film thickness of **1 mil** (**0.025 mm**).
 - a. Coordinate primer type with scheduled finish requirements in Sections 099100 "Painting" and 099600 "High Performance Coatings."
 - b. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of **0.5 mil** (**0.013 mm**) on each side.

2.5 METAL ROOF PANELS

- A. Standing-Seam, Vertical-Rib, Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
- 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal uncoated steel thickness as required to achieve performance requirements. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: Two- or Three-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Clips: Two-piece floating to accommodate thermal movement.
 - 3. Joint Type: Mechanically seamed.
 - 4. Panel Coverage: **16 inches** (**406 mm**).
 - 5. Panel Height: **2 inches** (**51 mm**).
- B. Finishes:
- 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil** (**0.013 mm**).

2.6 METAL WALL PANELS

- A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels [P1A]: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
- B. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels [P1A]: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.
 - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, **G90 (Z275)** coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, **Class AZ50 (Class AZM150)** coating designation; structural quality. Prepainted by the coil-coating process to comply with Nominal Thickness: **0.024 inch (0.61 mm)**.
 - a. Exterior Finish: Two- or Three-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Major-Rib Spacing: **12 inches (305 mm)** o.c.
 - 3. Panel Coverage: **36 inches (914 mm)**.
 - 4. Panel Height: **1.25 inches (32 mm)**.
- C. Tapered-Rib, Metal Liner Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
 - 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, **0.024-inch (0.61-mm)** nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: Siliconized polyester.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Major-Rib Spacing: **12 inches (305 mm)** o.c.
 - 3. Panel Coverage: **36 inches (914 mm)**.
 - 4. Panel Height: **1.25 inches (32 mm)**.
- D. Finishes:
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of **0.2 mil (0.005 mm)** for primer and **0.8 mil (0.02 mm)** for topcoat.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.

2.7 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Concealed-Fastener, Reveal-Joint-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a centered recess between panel edges and with a recessed joint between panels; 1-inch- (25-mm-) wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.
 - 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected per building by Architect from manufacturer's full range.
 - 2. Panel Coverage: 12 inches (305 mm).

2.8 THERMAL INSULATION AIR BARRIER SYSTEM

- A. Double-Layer High-R Liner System: Provide a layered system consisting of a continuous exterior air barrier-laminated glass-fiber blanket insulation with unfaced uncompressed glass-fiber blanket insulation with interior liner system where indicated.
- B. Air Barrier Insulation Layer: non-perforated breathable polyolefin-coated fabric.
 - 1. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
 - 2. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E2357.
 - 3. Vapor-Permeable Nonbituminous Sheet: Minimum 20-mil- (0.5-mm-) thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side.
 - a. Physical and Performance Properties:
 - 1) Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E2178.
 - 2) Puncture Resistance: Minimum 40 lbf (180 N); ASTM E154/E154M.
 - 3) Vapor Permeance: Minimum 15 perms (860 ng/Pa x s x sq. m); ASTM E96/E96M, Desiccant Method, Procedure A.
 - 4) Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested according to ASTM D4541 as modified by ABAA.
 - 5) UV Resistance: Can be exposed to sunlight for 50 days according to manufacturer's written instructions.
 - 4. Unfaced Metal Building Insulation: ASTM C991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

- a. Unfaced: Type I (blankets without membrane covering), passing ASTM E136 for combustion characteristics.
 5. Accessory Materials: Provide transition strips, termination strips, patching materials, adhesives, tapes, and sealants that recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
 - a. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vaporretarder.
 - b. Adhesive: Product recommended by vapor retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.
- C. Thermal Insulation:
 1. Unfaced Metal Building Insulation: ASTM C991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
 - a. Unfaced: Type I (blankets without membrane covering), passing ASTM E136 for combustion characteristics.
 2. Retainer Strips: For securing insulation between supports, 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- D. Roof and Wall Liner System: Provide interior liner at all insulated roof areas and interior wall areas exposed to view.
 1. Liner: ASTM C1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E96/E96M, Desiccant Method.
 - a. Composition: White polypropylene film facing, fiberglass scrim reinforcement, and metallized-polyester film backing.
 2. Retainer Strips: Minimum 0.02" x 1" x continuous length 100 KSI minimum yield high tensile strength, galvanized steel straps primed and painted to match insulation facing.
 3. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.9 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum ~~1-inch~~ (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide ~~1-inch~~ (25-mm) standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum ~~1-inch~~ (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, ~~0.018-inch~~ (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum ~~96-inch~~ (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, ~~0.018-inch~~ (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum ~~10-foot~~ (3-m-) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Roof Ventilators: Gravity type, complete with hardware, flashing, closures, and fittings.
- H. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- I. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
 - b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screw, with EPDM sealing washers bearing on weather side of metal panels.

- c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- 2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- 3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- 4. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.10 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 - 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 - 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. 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 with steel angles or cold-formed structural tubing between frame web and purlin web 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 if applicable, or punch for bolts.
 - 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. 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 uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

- 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.11 SOURCE QUALITY CONTROL

- A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.
 - 1. Accredited Manufacturers: **In-Shop** Special inspections (during fabrication) will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.
 - b. AC472 Accreditation **does not eliminate the need for inspections at the construction site** during assembly of the building. Refer to Specification Section 014100 "Special Inspections and Structural Testing" for onsite inspection and testing requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 - 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 structural framing.
- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- C. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Locate metal panel splices over structural supports with end laps in alignment.
 - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- D. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- E. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
 - 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 - 1. Install ridge caps as metal roof panel work proceeds.
 - 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-drilling or self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 - 5. Provide metal closures at peaks, valleys, rake edges, and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)** on slope and location lines and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 - 2. Shim or otherwise plumb substrates receiving metal wall panels.
 - 3. When two rows of metal panels are required, lap panels **4 inches (102 mm)** minimum.
 - 4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 - 5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
 - 6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 7. Install screw fasteners in predrilled holes.
 - 8. Install flashing and trim as metal wall panel work proceeds.

9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)**, noncumulative; level, plumb, and on location lines; and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.7 METAL SOFFIT PANEL INSTALLATION

- A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.
- B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.8 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder toward 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 the surrounding construction to ensure airtight installation.
 3. 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.
- B. Blanket Roof Insulation: Comply with the following installation method:
1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

3.9 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim 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.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (600 mm)** of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than **36 inches (914 mm)** o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with **1-1/2-inch (38-mm)** telescoping joints. Provide fasteners designed to hold downspouts securely **1 inch (25 mm)** away from walls; locate fasteners at top and bottom and at approximately **60 inches (1524 mm)** o.c. in between.
 1. Tie downspouts to underground drainage system indicated.
- E. Circular Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Mount ventilators on flat level base. Install preformed filler strips at base to seal ventilator to metal roof panels.
- F. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.
- G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.11 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 133419

SECTION 14 45 00 - VEHICLE LIFTS

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 5650 Lift, platform, vertical rise, surface mounted (Ref. Part 2.1)
 - 2. 5720 Lift, surface mounted, twin-post, 20,000 pound (Ref. Part 2.2)
- B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.
- C. Piping, wiring, and switching between equipment and utilities.

1.3 QUALITY ASSURANCE

- A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
- B. Quality standards shall meet or exceed ISO-9001 and be certified by the Automotive Lift Institute (ALI).
- C. Manufacturer's Representative:
 - 1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
 - 2. Training: Provide technical representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.
 - 3. Quality standards shall meet or exceed ISO-9001.

1.4 SUBMITTALS

- A. Product Data: Submit Product Data in accordance with Division 1 of these specifications.
- B. Operations and Maintenance Manual:
 - 1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
 - 2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
 - 3. Description of system and components.
 - 4. Schematic diagrams of electrical, plumbing, and compressed air system.
 - 5. Manufacturer's printed operating instructions.
 - 6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.
- C. Shop Drawings:
 - 1. Submit Shop Drawings in accordance with Division 1 - General Requirements.
 - 2. Submit site specific installation drawings and procedures.

1.5 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

- A. Warrant work specified herein for one year from final acceptance against defects in materials, functions, and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. All parts shall be readily available locally in the United States.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

1.8 LABELING

- A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.
- B. Manufacturer shall securely attach the ALI label of the Automotive Lift Institute.
- C. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 LIFT, PLATFORM, VERTICAL RISE, SURFACE MOUNTED

Equipment Identifier: 5650

- A. Manufacturer's Reference:
 - 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
ROTARY Model No.: V64-28 S	MADISON	IN	(812) 273-1622

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 STERTIL KONI	STEVENSVILLE	MD	(410) 643-9001
ALT #2 MOHAWK LIFTS	AMSTERDAM	NY	(518) 842-1431

B. General Description:

1. A vertical half-scissors heavy-duty platform lift to elevate large trucks, buses, and other heavy-duty vehicles for the purpose of inspection, maintenance, servicing and cleaning. Lift shall rise in a vertical fashion.

C. Capacities/Dimensions:

1. Overall dimensions:

Overall Dimensions		
Length	Width	Height
354 1/4"	109"	16 3/4"
Weight 0 lb		Capacity 64000 lb

2. Platform dimensions (two each):

- a. Length: 28 feet
- b. Minimum Width: 29-1/2 inches
- c. Maximum Height: 16-1/4 inches

3. Maximum Control Console Dimensions:

- a. Length: 27 inches
- b. Width: 30 inches
- c. Height: 52 inches

4. Minimum Lifting Height: 69 inches

5. Maximum Rise Time: 90 seconds

6. Platform Spacing: 45 inches maximum

7. Lowering speed: 130 seconds maximum

8. Number of ramps: 2

9. Ramp Length: 8 feet

D. Features/Performance/Construction:

1. The lift system shall be surface mounted to the finished floor.
2. Lift shall be provided with wheel stops on the opposite end of the ramps.
3. Lift shall be provided with flush flaps to cover the gap between the lift and the ramps. Flaps shall serve as wheel stops when lift is raised.
4. Complete lift assembly shall consist of an electro-hydraulic lift unit, control console, and specified accessories.
5. Support leg assembly: All support leg pivot points shall be provided with hardened bushings for extended life and ease of repair.

6. Platforms:
 - a. Each platform is constructed in a box design. The top box section shall be fabricated of at least 1/4 inch ASTM A572 GR50 steel plate. The sides and bottom sections of the box shall be fabricated of at least 3/8 inch ASTM A572 GR50 steel plates. All plates shall be bent and seam welded into a single platform assembly.
 - b. Each platform shall be finished with an anti-skid coating.
 - c. There shall be no obstructions of connections between the platforms at either floor level or platform level.
 - d. Each platform shall include an automatic wheel stop/chock, fabricated of 5/16 inch ASTM A572 GR50 steel plate. All wheel stops shall be interchangeable and deploy to meet ALI/ALCTV requirements.
 7. Lift system shall incorporate a hydraulic driven cylinder.
 8. The maximum lifting height of the lift system shall be programmable to the height specifications as requested by user.
 9. Entire lift assembly shall consist of an electro-hydraulic unit which drives four cylinders mounted to the half scissors lifting devices using a pull rod.
 10. Drive mechanism:
 - a. The drive system shall be hydraulic and shall permit lifting without any pulsation, jerks, or unsteady lifting. Lifting shall be smooth. The hydraulic power unit shall be an electrically-powered pump, flow control valves, and a fluid reservoir.
 - b. Hydraulic lifting cylinders shall be of a piston type to prevent leakage in the case of piston damage.
 - c. All rotating axles shall be hardened steel for long life and wear.
 11. Safety devices:
 - a. An independent and fail-safe mechanical safety device shall be present on each half scissor. This safety device shall be totally independent from the lifting drive system. A locking catch shall be free to engage all of the teeth of the locking strip attached to the half scissor.
 - b. Each lifting device shall be provided with a position measuring device identified as an inclinometer whose function it is to calculate and synchronize the height of the four lifting devices.
 - c. The lift system shall incorporate a splash proof electrical system (IP 65) so that the lift can be used in a washroom environment without damage to electrical components.
 - d. Lift shall be equipped with a tape switch along the outside of both runway platforms. Lift shall automatically stop lowering if any contact is made with the switch.
 - e. Locking mechanism shall be activated in no less than 3 inches (76 millimeters) of lifting height.
 12. Lighting system:
 - a. Lift shall have a complete lighting system installed on the inner edge to illuminate the work area when the vehicle is raised.
 - b. The LED lighting shall be 120 AC, and rated IP 65
 - c. Individual lamps shall utilize waterproof construction and shall contain ballast and starter assembly integrated within one operating unit.
 - d. Lamps shall be installed in a recessed adjacent to main lifting platform so as to be protected from potential damage caused by falling objects.
 - e. The lighting system must have safety certification from a Third Party Testing Laboratory such as ETL, UL, CE, or TUV. This certification will be required so as not endanger operator with unsafe working conditions.
 - f. Due to safety regulations, the lighting shall switch on and off at a minimum height when the lift is going up (on) and down (off) and this feature shall be programmable based on operator specifications.
- E. Controls:
1. The printed circuit board to provide various safety and operational requirements.
 2. The lift system shall have all control voltage rated to a maximum of 24 VDC.
 3. Each control box shall have as a minimum:

- a. System disconnect.
 - b. "Power-on" pilot lamp.
 - c. An "up" button
 - d. A "down" button
 - e. Lock release button
 - f. If needed: Lighting switch.
 4. If needed: The lift shall have a two-speed lowering option.
 5. Control panel shall be rated IP 65.
- F. Accessories:
1. Repair Bays:
 - a. Air supply set:
 - b. Rolling Bridge Jacks:
 - 1) Bridge jack(s) shall be self-powered and air-hydraulic. Two bridge jacks shall be provided.
 - 2) Each bridge jack shall be double telescopic piston with a minimum capacity of 32,000 pounds.
 - 3) The bridge jack shall be designed with a flow divider valve to maintain synchronization of pistons in raising and lowering mode; maximum pressure valve shall prevent lifting of loads if loads exceed rated capacity of jack; check valves in each piston shall prevent the accident descent of load.
 - c. Remote control:
 - 1) Remote control shall allow full function control of the lift, with the following:
 - a) Push/Pull E-Stop Button.
 - b) Push buttons for Lift Raise, Lower and Unlock.
 - c) Selector button for synchronized, front, or rear lifting.
 - d) Push buttons for hydraulic moveable carriage drive.
 - 2) Remote control shall be equipped with an emergency E-Stop button that de-energizes power to all outputs of the PCB. Re-activation of the control system requires resetting the E-Stop and re-energizing the control system.
- G. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
208	3	20	41.40	DISCONNECT

Plumbing		
Domestic Water		
Connection (IN)	Flow Rate(CFM)	Capacity (PSI)

Natural Gas			
Connection (IN)	Capacity (BTU/Hr)	Pressure (PSI)	
		Minimum	Maximum

Compressed Air			
Connection (IN)	Flow Rate (CFM)	Pressure (PSI)	
		Minimum	Maximum
3/8"	5.00	90.00	110.00 psi

2.2 LIFT, SURFACE MOUNTED, TWIN-POST, 20,000 POUND

Equipment Identifier: 5720

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.

Manufacturer	City	State	Phone
ROTARY Model No.: SPO20	MADISON	IN	(812) 273-1622

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturer's, including the following, may be considered as equal.

Manufacturer	City	State	Phone
ALT #1 STERTIL-KONI USA INC.	STEVENSVILLE	MD	(410) 643-9001
ALT #2 MOHAWK RESOURCES LTD	AMSTERDAM	NY	(518) 842-1431

B. Capacities/Dimensions:

1. Overall dimensions, capacities, and weight:

Overall Dimensions		
Length	Width	Height
155"	124"	198"
Weight		Capacity
4400 lb		20000 lb

2. Adjustable height:
 - a. Minimum: 16 feet, 0 inches
 - b. Maximum: 16 feet, 6 inches
 3. Lift rise: 77 inches -80 inches (from floor to top of fully extended adapter)
 4. Distance between columns: 120-17/32 inches
 5. Drive-through clearance: 105-13/32 inches
 6. Arm reach:
 - a. Front: 34-11/16 inches minimum, 64 inches maximum
 - b. Rear: 34-11/16 inches minimum, 64 inches maximum
 7. Adapter height: 5-31/32 inches to 8-1/32 inches (floor to top of adapter)
 8. Adapter height with low extension: 10-3/4 inches (floor to top of adapter)
 9. Adapter height with high extension: 15-3/4 inches (floor to top of adapter)
 10. Lifting speed: 85 seconds
- C. Features/Performance/Construction:**
1. Columns shall be manufactured of one-piece formed steel. Carriage bearing surfaces shall be placed to the back of the column.
 2. Each column assembly shall incorporate an external locking latch mechanism which automatically engages at 4-1/4 inch increments after the first 19-1/2 inches of travel, continuing through full rise. Dual locking latch system release

- shall be constant pressure air operated switch. Locking latches shall be spring actuated and shall automatically reset when the latch handle is released. There shall be no less than 14 locking positions per column assembly.
3. Each hydraulic cylinder shall be designed with a restrictor orifice to regulate the lowering speed so that it shall not exceed 20 feet per minute at rated capacity. Cylinder shall be installed so that all lifting force is applied directly to column base and is not attached to the carriage. Cylinder replacement shall be achieved without disassembly of columns, column extensions, or overhead assembly.
 4. Arm/adapter assembly shall consist of four telescoping swing arm assemblies. Each arm assembly shall have an adapter base which is laterally adjustable and shall be equipped with a screw type adjustable height vehicle contact adapter, 5 inch and 10 inch adapter extensions shall be provided for additional adapter height. The vehicle contact adapter shall be capable of accommodating optional adapters for special lifting applications. Each arm assembly shall be equipped with an arm restraint feature, capable of withstanding 150 pounds of horizontal force, which shall engage when the carriage has been raised 1 inch and shall automatically release when the carriage is fully lowered.
 5. Floor-mounted, three-position wheel spotting dishes shall be provided.
 6. Power unit shall be self-contained. Fluid system shall have a 16 quart capacity. Standard power unit shall be suitable for indoor or outdoor use.
 7. Lift shall be equipped with a mechanical equalization system consisting of adjustable cables and sheaves with self lubricating bearings.
 8. Lift shall be equipped with an overhead limit switch composed of a padded overhead trip bar which actuates a limit switch wired to interrupt the power to the power unit in the event that a vehicle contacts the trip bar.
 9. Lift shall be anchored to foundation. Foundation requirements and mounting methods shall be verified with manufacturer's shop drawings.
- D. Controls: Single point manual controls push down button "UP" and lowering lever for descent mounted on lift column.
- E. Accessories:

Description	Manufacturer	Model No.	Qty.
AIR/ELECTRIC BOX	ROTARY	FA5911BK	1

- F. Utility Requirements:

Electrical				
Voltage	Phase	HP	Amperage	Connection Type
208	1	4	20.00	DISCONNECT

Plumbing			
Domestic Water			
Connection (IN)	Flow Rate(CFM)	Capacity (PSI)	
Natural Gas			
Connection (IN)	Capacity (BTU/Hr)	Pressure (PSI)	
		Minimum	Maximum
Compressed Air			
Connection (IN)	Flow Rate (CFM)	Pressure (PSI)	
		Minimum	Maximum
1/4"	5.00		

- G. Finish: Durable enamel in manufacturer's standard color

PART 3 - EXECUTION

3.1 INSPECTION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.
- C. Report in writing to the Architect, any damaged, missing or incomplete scheduled equipment and improper rough-in or utility stub-outs.

3.2 INSTALLATION

- A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.
- B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
 4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.
- B. Each lift shall be tested with the vehicle types operated by the Owner.

3.4 CLEANUP

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.5 TRAINING

- A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
 - 1. 5650 Lift, platform, vertical rise, surface mounted; 8 hours (minimum)
 - 2. 5720 Lift, surface mounted, twin-post, 20,000 pound; 2 hours (minimum)
- B. Demonstrate each lift operation utilizing each of the vehicle types operated by Owner.
- C. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 14 45 00

A. GENERAL

1. SCOPE OF WORK

- a. The Sprinkler Contractor shall be licensed for sprinkler work.
- b. The Sprinkler Contractor shall provide all materials and labor necessary to install a complete and operating sprinkler system in accordance with the Engineering Drawings and as specified herein.

2. Quality Assurance

- a. All work shall be in accordance with State Building Codes, National Fire Protection Association and all applicable codes.
- b. The Notice to Bidders, Instructions to Bidders, General Conditions, and Supplementary General Conditions are a part of these specifications.
- c. Any inspection and test charges required for the sprinkler work by approving authorities and Owners and any permits needed for installation of a complete system shall be secured and paid for by the Sprinkler Contractor.
- d. Where the words "Approved", "Approval", or "Approved Equivalent" appear, it is intended that items other than the model number specified shall be subject to approval of the Engineer.
- e. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall require and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- f. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer ten (10) days before the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required. Items that are submitted for approval after this date will not be accepted.
- g. The Sprinkler Contractor shall refer to the General Conditions for provisions of temporary utilities required under this Contract.
- h. All work shall be performed in accordance with U. S. Department of Labor, Occupational Safety and Health Standards.
- i. The entire system will be accepted as a unit. There will be no partial acceptance.
- j. The Owner shall provide heat in the building to protect the wet pipe system after acceptance of the system and provide all fire extinguishers.

3. Submittals

- a. See General and Supplementary General Conditions.
- b. Within ten days after notification of the award of contract and written notice to begin work the Contractor shall submit to the Architect/Engineer for approval, a detailed list of

equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Four sets of submittal data shall be provided for approval.

- c. Each submittal shall bear the approval of the Contractor indicating he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.
- d. Shop drawings and data sheets shall provide all pertinent information for proper evaluation of each item. The drawings are diagrammatic only and are not intended to show minor details and exact locations. Locations of pipes, ducts, electrical raceways, panels, equipment, light fixtures, ceiling diffusers, etc., shall be reviewed, and anticipated interferences shall be coordinated with other Prime Contractors prior to installation. Lines, whose elevation cannot be changed, shall have the right-of-way, and larger lines shall have the right-of-way over smaller lines. Shop drawings shall show all principal dimensions, "tie-in" dimensions, sizes and locations.
- e. The Contractor shall submit to the Engineer a set of accurately marked plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these As-Built Plans.
- f. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data and sufficient manufacturer's literature to operate and maintain all equipment.
- g. The Contractor shall submit to the Owner all certificates required for operating system in compliance with state and federal regulations.

4. Product Delivery, Storage and Handling

- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner. Designated areas for material storage will be established by the Owner, and each Contractor will be responsible for maintaining his own area.
- b. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

5. Work Conditions and Coordination

- a. The Contractor shall review the plans of all other Prime Contractors on the job and inform them of anticipated areas of conflict prior to installation of fire protection system.
- b. The Contractor shall review the electrical requirements for the equipment provided and establish points of connection and the extent of electrical work to be provided in his Contract. All electrical work shall be performed by a licensed electrical contracting firm.

- c. The Contractor will be responsible for the final electrical connections to all equipment installed as part of his contract. Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Electrical Contractor.
 - d. Electrical work by this Contractor shall be in accordance with all state and national codes, and as specified in Division 16 contained herein.
 - e. Pipe sleeves and chases required for the installation of a complete fire protection system shall be furnished by this Contractor, and he shall be responsible for coordinating the location and correct number of all required openings. The Contractor will be responsible to the General Contractor for coordinating this work with his schedule and will not cause him any undue hardship or loss of time.
 - f. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.
6. Guarantee
- a. Contractor will provide extent and length of warranty and guarantee for all products with his submittals. If no warranties are available or offered, it shall be understood that the Contractor shall guarantee and warrant all materials and labor done under his contract for 12 months from the date of acceptance.
 - b. Where extended warranties or guaranties are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Owner.

B. PRODUCT

- 1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2. The Contractor shall provide nameplates for identification of all equipment, switches, panels, etc. The nameplates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core.
- 3. All materials, products and equipment and components thereof which make up a complete fire protection system, shall be such as appear on the Fire Underwriters Equipment List of the Underwriters Laboratories, Inc.

C. EXECUTION

- 1. Inspection
 - a. This Contractor shall examine all areas of completed work prior to installation of the fire protection systems and insure that no defects or errors are present which would result in the poor application or installation of subsequent work.
 - b. It is the responsibility of this Contractor to coordinate all work performed by others for this Contractor. Upon inspection, should errors or omissions be found, it will be the responsibility of this Contractor to resolve the problem at no cost to the Owner.

2. Installation

- a. All work shall be performed in a manner indicating proficiency in the trade.
- b. All pipes, conduit, etc., shall be either parallel to the building walls or plumb where installed in a vertical position, unless otherwise noted, and shall be concealed when located in architecturally finished areas.
- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- d. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- e. This Contractor shall familiarize himself with the method and schedule of installation of poured concrete floors and walls. He shall lay out his work in advance and furnish all sleeves and opening locations to the General Contractor for installation. This Contractor shall provide and install all inserts and hangers required to support his equipment, pipes, conduit, etc.
- f. All piping and conduit shall be accurately roughed in according to manufacturer's installation dimensions so that no offset adaptors, flexible connections or other imprecision not required by the manufacturer are necessary. All incorrect work shall be torn out and corrected and walls and floors patched at no expense to the Owner.
- g. Items such as alarms, valves, test connections, drains, etc., shall be accessible for operating, servicing, maintaining and repairing. Those which are installed in unsuitable locations shall be relocated as directed by the Architect/Engineer at no cost to the Owner.
- h. Connections to water, soil and waste lines shall be made at locations shown on the drawings.

3. Performance

- a. This Contractor shall perform all excavation and backfill operations necessary for installation of his work.

4. Erection

- a. All support steel, angles, channels, pipes or structural steel studs and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided and installed by this Contractor, unless otherwise noted.

5. Field Quality Control

- a. Testing and Flushing
 - i. Upon completion of work, inspection and tests shall be made by the Contractor's representative and witnessed by an Owner's representative. All defects shall be corrected and system left in service before a final certificate is issued. The NFPA Contractor's Material and Test Certificate shall be completed and signed by both representatives. Copies shall be prepared for approving authorities, Owner and Contractor.

- ii. The entire fire protection system, including yard piping, shall be hydrostatically tested at not less than 200 pounds per square inch pressure for two hours or at 50 pounds per square inch in excess of the maximum static pressure when the maximum static pressure is in excess of 150 pounds. The hydrostatic test pressure shall be measured at the low point of the individual system or zone being tested.
- iii. The inside sprinkler piping shall be installed in such a manner that there will be no visible leakage when the system is subjected to the hydrostatic pressure test.
- iv. The yard piping test shall be made before the joints are covered in order that any leaks may be readily detected. Leakage shall not exceed 2 quarts per hour per 100 joints. It is important to backfill the trench between joints before testing to prevent movement of pipe. The yard piping shall be flushed before connecting to the internal sprinkler system.
- v. Instruments, specialties and equipment subject to damage shall be isolated during tests.
- vi. Prior to final acceptance, each control valve shall be closed and opened under pressure, to insure proper operation.
- vii. Test of drainage facilities shall be made while the control valve is wide open. The main drain valve shall be opened and remain open until the system pressure stabilizes.
- viii. Final report forms shall be prepared, delivered to and approval obtained from local authorities, IRI, and any other agency having approval authority and delivered to the Owner. Contractor's Certificate covering materials and tests shall be prepared and delivered to the Owner.

END OF SECTION 210500

A. GENERAL

1. This Contractor shall be responsible for the final electrical and the entire control system and control connections to all equipment installed as part of his contract.
2. Wiring from panelboard circuit breakers, etc. up to disconnect switch shall be by the electrical contractor. Wiring from disconnect through equipment and final electrical connections to mechanical equipment shall be by this contractor.
3. All power and control wiring shall be in conduits.
4. All electrical work shall be performed by a licensed electrician.
5. All electrical work shall be in accordance with the State Building Code and all its supplements and the latest edition of the National Electrical Code.

B. PRODUCT

1. All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
2. Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
3. All conductors and conduits shall be sized as noted on the plans or as required per NEC.

C. EXECUTION

1. All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
2. Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid- Tite" conduit. Connection to other equipment shall be made with rigid conduit.
3. Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 210513

A. GENERAL

1. The Sprinkler Contractor shall provide all materials and labor for the installation and make operational a complete sprinkler system.
2. The sprinkler system shall meet all NFPA Standards and approval by governing authorities, and all other authorities having approval jurisdiction shall be received prior to and after installation.
3. All materials shall be new, and all materials, products and equipment and components thereof shall be such as appear on the Fire Underwriters' Equipment List of the Underwriters' Laboratories, Inc.
4. The Contractor shall provide the Owner with instruction charts describing operation and proper maintenance of sprinkler devices, and a copy of the publication, NFPA No. 13A, latest edition, entitled "Care and Maintenance of Sprinkler Systems".
5. Before asking final approval of automatic sprinkler equipment by the authorities have jurisdiction, the Contractor shall furnish a written statement to the effect that the work covered by his Contract has been completed and tested in accordance with the approved specifications and drawings.
6. See Section 21 05 00, Item C, EXECUTION, Paragraph 5, Field Quality Control for Acceptance Tests Requirements.
7. Testing of all piping shall be made in the presence of the Engineer or designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.

B. PRODUCT

1. Piping
 - a. Piping 2 1/2" and larger shall be schedule 10, and piping 2 " and smaller shall be schedule 40, steel pipe conforming to ASTM Specification A795. Other type piping may be submitted for approval only if listed, and it meets the standards cited in NFPA.
 - b. Standard weight welding fittings shall be used and shall conform to ANSI B16.11.
 - c. Screwed fittings shall be malleable iron, 150 pounds s.w.p. with banded pattern conforming to ANSI B16.3.
 - d. Standard riser plate signage shall be provided on each system riser.
 - e. Dry pipe shall be internally galvanized steel pipe
 - f. Grooved end fittings shall be ductile iron and conform to ASTM A536, Grade 65-45-12. Short-pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
 - g. Grooved Joint Couplings: Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12, with pressure-responsive elastomer gasket conforming to ASTM D-2000, and zinc-electroplated carbon steel bolts and nuts conforming to ASTM A-449 and ASTM A-183. Couplings shall comply with ASTM F1476.
 - i. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-13. Victaulic Style 009H and 107H/107N (Quick-Vic™). Installation ready rigid coupling for direct stab installation without field disassembly.

1. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue and recess type couplings, which require the use of a torque wrench to achieve the exact required gap between housings, are not permitted.
 - ii. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Installation-Ready Style 177 or Style 77.
2. Hangers and Supports
 - a. Inserts set in concrete shall be coordinated with the General Contractor. See Specification Section 21 05 29.
 - b. Hangers shall be furnished and installed by the Sprinkler Contractor. See Specification Section 21 05 29.
3. Sprinkler Heads
 - a. Only listed sprinkler heads shall be used. Sprinkler heads shall not be altered in any respect, nor have any type of ornamentation or coatings applied after shipment from the place of manufacture.
 - b. Guards shall be furnished wherever heads will be subject to damage.
 - c. The Contractor shall provide the Owner a cabinet containing a minimum of 6 spare sprinklers of each type used in the installation. A special sprinkler wrench shall also be provided to be used in the removal and installation of sprinklers. Mount cabinet adjacent to riser.
 - d. Where possible, all sprinkler heads shall be trimmed with materials to allow ceiling tile replacement.
4. Sprinkler Alarms
 - a. Alarm check valve of the approved type with water motor alarm gong, riser trim, drain valves and riser lines shall be located at the main system control valve as indicated on the Drawings.
 - b. Water flow switches are to be furnished and installed by the Sprinkler Contractor.
 - c. Wiring from flow switches and alarm valves to fire alarm control panel shall be by Electrical Contractor.
5. Gauges
 - a. Approved pressure gauges shall be installed as indicated on the Drawings. The gauge connection shall be equipped with a shut-off valve and with provision for draining.
 - b. The pressure gauges shall be of approved type and shall have a maximum limit not less than twice the normal working pressure at the point where installed. They shall be installed to permit removal and shall be located where they will not be subject to freezing.
6. Valves
 - a. Shut-off valves shall be Jenkins Figure 825-A, or approved equivalent by Crane or Nibco.
 - b. Check valves shall be Jenkins Figure 629, or approved equivalent by Crane or Nibco.
 - c. Inspector's Test Valve: Provide inspector's test valve and piping as shown on the Drawings.

- d. Standard design identification signs shall be provided on all control drain, test and alarm valves.

C. EXECUTION

1. Pipe 2" and smaller shall have screwed joints.
2. Pipe 2 1/2" and larger shall be welded or grooved joint fittings. Welding of pipe shall be in accordance with NFPA 13, Chapter 3-3.12.4.
3. Welding ties or weldolets shall be used.
4. No "stub-in" shall be permitted.
5. Screwed unions shall not be used on pipe larger than 2". Couplings and unions of other than screwed type shall be of types approved specifically for use in the sprinkler systems.
6. Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
7. A one-piece reducing fitting shall be used wherever a change is made in the size of the pipe, except hexagonal or face bushings may be used in reducing the size of the openings of fittings when standard fittings of the required size are not available.
8. Hangers supporting horizontal piping shall be installed and spaced in accordance with NFPA 13, Chapter 3-3.14.
9. Sleeves shall be provided wherever pipes pass through walls, floors, and ceilings. Sleeves shall be schedule 40, black steel, 1/2" in diameter larger than the pipe or insulation on the pipe. Sleeves through wall and ceiling shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight. Pipes passing through sleeves shall be painted with a rust inhibiting paint. Pipes passing through fire walls or floors shall be sealed to conform to Underwriters' Laboratories requirements.
10. Installation of hangers and inserts shall be coordinated with all other Contractors on a priority basis. Each Contractor shall be responsible for providing all inserts, hangers, and rods necessary for the installation of his work.
11. Spacing, location and position of sprinkler heads and piping are approved on plans and shall be in accordance with minimum standards set forth in NFPA 13, Chapter 3.
12. All sprinkler heads, unless otherwise noted, will be centered in ceiling tiles.
13. All sprinkler heads, unless otherwise noted, will be installed on a swing connection.
14. All piping tests for the sprinkler system shall be in accordance with NFPA 13, Chapter 1-1.11.3. A Contractor's Material and Test Certificate Part "C" will be filled out for each riser by the Contractor and signed with copies prepared for approving authorities, Owner, and Architect/Engineer. Any leaks that occur shall be repaired and another test started. All defects shall be corrected and the system left in service before the Contractor leaves the job.

15. All exposed piping shall be painted Safety Red. In finished spaces the color may will be dictated by architectural plans.

END OF SECTION 210523

SECTION 210529 – PIPE SUPPORTS

A. GENERAL

1. This Section includes hangers and supports, etc. as may be required to provide a complete sprinkler piping system.
2. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.

B. PRODUCT

1. Piping shall be as stated in Section 21 05 23.
2. Hangers and Supports shall be as follows:

Concrete Inserts	Fig. B2500
Hanger Rod	Fig. B3205
Riser Clamp	Fig. B3373
Clevis Hanger	Fig. B3100
Pipe Saddles	Fig. B3160
Rod Ceiling Plate	Fig. B3199
Beam Clamps	Fig. B-3033

Figure numbers given above are devices as manufactured by Eaton, Inc. Equals by Erico, Viking or Anvil are acceptable.

C. EXECUTION

1. Hangers supporting horizontal piping shall be spaced in accordance with NFPA 13.
2. Hangers shall be provided at each change in direction. Vertical risers shall be supported at each floor, 5 feet on center and/or at changes in direction of pipe.
3. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be schedule 40, black steel, 1/2" diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight.

END OF SECTION 210529

SECTION 21 30 00 – FIRE PUMPS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This section includes the provision, delivery, installation and startup of one (1) factory built packaged fire pumping system, complete with enclosure, for installation at the North Carolina Forestry Service Region 1 Headquarters facility located in Duplin County, NC. The factory built packaged fire pumping system shall include a diesel engine driven fire pump and associated controller, internally mounted diesel fuel tank with fuel delivery system, an electric driven jockey pump and associated controller, interconnecting piping, valves, wiring, and accessories all skid mounted as a complete system and housed inside a skid mounted environmental enclosure. The packaged system shall be certified and labeled for its intended use and built according to these specifications and as shown on the plan drawings.
- B. REFERENCE STANDARDS
 - a. NFPA 20, 2013 Edition, Installation of Stationary Pumps for Fire Protection
 - b. NEC 70, National Electrical Code
 - c. ASME, American Society of Mechanical Engineers
 - d. ASTM, American Society for Testing and Material
 - e. ETL, Third Party Certifying Agency
 - f. AWS, American Welding Society

1.2 QUALITY ASSURANCE

- A. Comply with NFPA 20 2020 edition and local and state codes of Duplin County, North Carolina.
- B. System shall be fabricated and assembled in an ISO 9001-2015 certified facility and certified by a qualified testing laboratory and comply with NC General Statute §§ 66-25.
- C. System shall bear the ETL label for packaged fire pump systems based on NFPA 20 2020 edition.
- D. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified or denoted on the drawings.
- E. The skid mounted fire pump shall be assembled by the pump manufacturer. A packager of fire pump skids that is not engaged in the design and construction of NFPA Listed fire pumps shall not be considered as a fire pump manufacturer. The manufacturer of the packaged fire pumping system shall assume "Single Source Responsibility" for the complete fire pump system.
- F. Test pumps, drives and controllers, at the factory to ensure their performance as specified and as required by NFPA 20 2020 edition. Copies of the certified factory test data shall be available for comparison during field acceptance tests.
- G. The manufacturer shall carry a minimum product liability insurance of \$2,000,000 per occurrence with an aggregate product liability of \$6,000,000.
- H. Test all electrical components for proper installation, connection and operability.
- I. Furnish all material that is new and unused and free from defects, cracks and imperfections.
- J. Manufacturer Qualifications:
 - a. The Fire Pump Manufacturer and the Packaged Fire Pump System Manufacturer/Assembler shall be the same.
 - b. The Packaged Fire Pump System Manufacturer shall have a minimum of 20 years of experience in the production and assembly of fire pumps and packaged fire pump systems.
- K. Provide the services of a qualified manufacturer's representative to assist in the installation, complete checkout, startup, and commissioning of the packaged fire pumping system.
- L. The Manufacturer and their Local Distributor shall have the capability to provide repair, maintenance and parts supply service for all furnished components.

- M. Do not commence fabrication and assembly of the packaged fire pump system until review of all submittal data by Owners Representatives is completed and approval and written release to production is received.
- N. Architect, Engineer and/or Owners Representative shall be able to inspect the construction of the packaged fire pump system at the manufacturers facility with 72-hour notice.

1.3 PACKAGED FIRE PUMPING SYSTEM MANUFACTURER REQUIREMENTS

- A. Packaged Fire Pumping System Manufacturers bidding this project shall furnish the following:
 - a. A complete written specification for the proposed packaged fire pumping system, including operating sequence, alarm sequence, and a detailed bill of materials.
 - b. A written statement from the manufacturer certifying full conformance to this specification and the system layout and dimensions as shown on the plan drawings, including the provision of the specified materials and equipment and accessory brands listed or pre-qualified and approved by the Engineer. The statement shall be signed by an officer of the manufacturing firm, and the document shall be notarized.
 - c. Complete submittal data for all major equipment, as listed in this specification, including properly indicated pump curves.
 - d. A project specific electrical schematic showing power and control wiring for the complete system including the enclosure.
 - e. Installation list of 20 similar packaged fire pumping systems which have been in operation for a minimum of 5 years. The list shall include the contact name and phone number for each installation that the Engineer may contact to ask about their experience working with the manufacturer and the equipment provided.
 - f. Location and contact information of the closest factory owned and/or factory trained service centers and the date of the last factory training session performed with the service center.
 - g. To ensure that the manufacturer submitting has acceptable quality assurance programs in place, the manufacturer shall submit copies of their ISO9001:2015 Certificate of Registration, their UL Authorization QCZJ.E189340 Packaged Pumping Systems, their UL Authorization NITW.E59076 Industrial Control Panels, and their ETL Authorization under sections 219, 225, and 281 as a part of the pre-qualification submittal. ISO9001:2015 certifications, Quality Management Certificates, UL Authorizations and ETL Authorizations that list the names of parent companies or subsidiary companies are not acceptable.
 - h. A copy of the manufacturer's current certificate of insurance showing a minimum product liability insurance of \$2,000,000 per occurrence with an aggregate product liability of \$6,000,000.
 - i. To ensure that all welding will be accomplished according to ASME standards, copies of all fabricating employees' ASME Section IX pressure vessel certification and AWS D1.1 structural certification shall be included in the pre-qualification submittal.
 - j. A listing of the manufacturer's or authorized service provider's employees authorized for system commissioning and start up, including each employee's name, employee number, years of experience in starting, commissioning, and testing packaged fire pump systems, contact information, and the employee's supervisor's name and contact information.
 - k. Manufacturer requests for the substitution of major equipment brand, size, type or function shall be made in writing prior to the preparation of the pre-qualification submittal, and shall only be included in the pre-qualification submittal if previously approved by the Engineer. Otherwise, major equipment shall be as specified in brand, size, type and function as described herein and on the plans. In no way shall the substitution of an approved alternate piece of major equipment cause the price of the packaged fire pumping system to increase. Instead, a significant decrease in the price shall be expected and required due to the substitution.

1.4 SUBMITTALS

- A. Submit each item in this article according to the conditions of the contract and specifications sections.

- B. Submit manufacturer's installation instructions under provisions of General Conditions.
- C. Product data including certified performance curves and related capacities of selected models, weights, furnished specialties and accessories. Indicate the project specific pump operating conditions on pump performance curves.
- D. All submittal information shall be in electronic format and a hard copy shall be made available if requested

1.5 DELIVERLY, STORAGE AND HANDLING

- A. Protect all equipment, connection surfaces, piping, wiring, fluid passages and working parts from damage during shipment, handling, storage, and installation.
- B. The packaged pumping system shall be factory assembled and shipped as a complete unit unless shipment in sections is absolutely required or unless shipping restrictions or equipment limitations dictate that smaller portions must be shipped.
- C. Deliver equipment and accessories to the specified location for unloading.
- D. Store material in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- E. Repair or replace all items damaged during shipment, delivery, or installation.

1.6 WARRANTY

- A. Warrant that all supplied components will function as specified and as a complete functional system in accordance with all applicable codes and free from defects in design, assembly, manufacturer and workmanship for a minimum of twelve (12) months after startup or eighteen (18) months after shipment whichever occurs first.

PART 2- PRODUCTS

2.1 SYSTEM COMPONENTS

- A. Fire Pump:
 - 1. Quantity: One (1)
 - 2. Type: Diesel Engine Driven
 - 3. Design: Pumps shall furnish not less than 150 percent of rated capacity at not less than 65 percent of total rated head
 - 4. Maximum shutoff head: The shutoff head shall not exceed 140 percent of rated head.
 - 5. Operating Conditions:
 - a. Capacity: 1000 GPM
 - b. Total discharge head: 75 PSI
 - c. Maximum Shutoff Head: 120 PSIG
 - d. Maximum Speed: 1760 RPM
 - e. Fire Pump Controls Voltage: 120/1/60
 - 6. Pump Type: Horizontal Split Case
 - 7. Pump Materials:
 - a. Casing: Cast Iron
 - b. Impeller: Bronze
 - c. Shaft: Steel
 - d. Stuffing Box Packing: Non-asbestos
 - e. Seal Tubing: Integral with casting, Brass
 - f. Connections: Flanged class 250
 - 8. Provide fire pump accessories in accordance with NFPA 20 2020 edition including but not limited to:
 - a. One (1) automatic air release valve
 - b. One (1) pump suction gauge, range 30-0-30 with shutoff cock
 - c. One (1) pump discharge gauge, range 0-300 with shutoff cock
 - d. Common rigid structural steel baseplate (elevated as required) for each pump and its associated drive.

- e. Drive shaft with OSHA approved guard.
 - f. One manufacturer nameplate for the fire pump, stating:
 - 1) pump capacity
 - 2) total head
 - 3) pump RPM
 - 4) manufacturer's model and serial number
 - 5) casing working pressure
 - 9. Acceptable Fire Pump Manufacturers
 - a. SPP Pumps USA
 - b. Ameriflow
 - c. Ready Buffalo
 - d. Engineer Pre-Qualified and Approved Equal
 - 10. Pump Design and Construction: Pump shall be UL Listed and FM Approved.
- B. Diesel Engine Drive:
- 1. Quantity: One (1)
 - 2. Type: direct drive, designed for operation on diesel fuel for fire pump service, in accordance with NFPA 20 2020 edition.
 - 3. Horse Power Rating: Not less than 110 percent of maximum brake horsepower (after derating for altitude in accordance with NFPA 20 2007 edition) required to drive the pump at rated speed.
 - 4. Engine Manufacturer:
 - a. Clarke Fire Power
 - b. Cummins
 - c. Caterpillar
 - d. Engineer Pre-Qualified and Approved Equal
 - 5. Provide accessories for each drive including but not limited to the following:
 - a. Adjustable governor capable of regulating speed within a range of 10 percent between shutoff and maximum load conditions of pump.
 - b. Overspeed shutdown device
 - 1) Designed to stop engine at 20 percent above rated speed
 - 2) Position: Supervised so automatic controller will show overspeed trouble signal until shutdown device is manually reset
 - 3) Manual reset
 - c. Speed Switch:
 - 1) Function: Signal engine running and crank termination.
 - 2) Source of Power: Source other than engine generator or alternator.
 - d. Instrument Panel including but not limited to:
 - 1) Tachometer
 - 2) Oil pressure gauge
 - 3) Water temperature gauge
 - 4) Hour meter
 - 5) Ammeter
 - e. Cooling System:
 - 1) Type: Closed circuit.
 - 2) Water source: Discharge side of pump.
 - 3) Components:
 - a) Engine drive circulating pump.
 - b) Heat exchanger.

- c) Engine jacket temperature regulator or thermostat.
 - d) Two manual shut off valves for cooling water supply.
 - e) Strainer for cooling water supply.
 - f) Pressure regulating valve for cooling water supply.
 - g) Pressure gauge for engine side of cooling water supply before last manual valve.
 - h) Valved bypass around circuit from inlet side of first valve to outlet side of second manual valve.
 - i) Visible open waste cone.
 - j) Heat exchanger discharge shall be piped to the floor drain.
 - f. Water cooled jacketed exhaust manifold.
 - g. Jacket water heater, 120 VAC, single phase, 60 hertz.
 - h. Flexible metallic fuel lines, with necessary protection.
 - i. In line fuel filter.
 - j. Oil pressure safety switch.
 - k. Air cleaner.
 - l. Engine driven oil pump.
 - m. Enclosed control wiring.
 - n. Electric starter with voltage regulator.
 - o. Two heavy duty 12 volt, lead acid batteries, with corrosion resistant battery rack and cables as required; charged from engine generator or alternator and automatic trickle charger.
 - p. Residential grade engine exhaust silencer with spark arrestor, flexible exhaust connection, ventilated thimble (as required) and suitable factory painted or galvanized supports for supporting silencer. A flexible connector with flange connections shall be provided at the engine. Flexible sections shall be stainless steel and suitable for diesel-engine exhaust gas at 1000 deg F minimum.
 - q. Horizontal factory painted double wall carbon steel UL labeled fuel storage tank, with legs, level gauge, low level fuel switch, vent with flame arrestor, and necessary connections for fill, outlet, and fuel return. The fuel tank shall have a capacity at least equal to 1 gal per horsepower (5.07 L per KW), plus 5 percent volume for expansion and 5 percent volume for sump per NFPA 20 2007 edition 11.4.3.1. Tank shall be equipped with a leak sensing float switch wired to the diesel controller.
 - r. Fuel tank piping shall be flexible hose in double containment protective piping with lockable ball valve in supply line, there shall be no shutoff valve in the return fuel piping.
- C. Diesel Fire Pump Controller:
- 1. The Fire Pump Controller shall meet the requirements of NFPA 20 2020 edition.
 - 2. The controller shall have twin battery chargers meeting NFPA 20 2020 edition requirements. The battery chargers shall have reverse polarity protection/indication and be capable of recharging a completely discharged battery within 24 hours. The chargers shall auto detect the input voltage of either 120 VAC or 220 VAC and shall be able to be programmed for either 120 VDC or 24 VDC output.
 - 3. A solid state pressure transducer shall be installed in a bulkhead in the enclosure bottom so that all plumbing connections are made external to the controller. The controller piping and pressure system shall be rated for pressures up to 600 psig within +/- 1.5% accuracy.
- D. Jockey (Pressure maintenance) Pump:
- 1. Quantity: One (1)
 - 2. Configuration: Vertical Multistage
 - 3. Materials:
 - a. Casing: Cast iron and stainless steel
 - b. Shaft: Steel
 - c. Trim and impeller: Bronze or stainless steel
 - 4. Operating Conditions:

- a. Capacity: 10 GPM
 - b. Total head 85 PSIG
 - c. Maximum Shutoff Head: 150 PSIG
 - d. Speed: 3500 RPM Maximum
 - e. Voltage: 208/3/60
5. Provide accessories including but not necessarily limited to:
 - a. Common structural steel baseplate for pump and drive elevated as required.
 - b. Motor: TEFC
6. Manufacturer's nameplate stating:
 - a. pump capacity
 - b. total head
 - c. manufacture's model number and serial number
7. Acceptable manufactures:
 - a. Ebara
 - b. Webtrol
 - c. ITT Goulds
 - d. Engineer Pre-Qualified and Approved Equal
- E. Jockey Pump Controller
 1. Function: Cycling jockey pump to maintain system pressure of 75 psig; pump shall start at 70 and shut off at 80.
 2. Jockey pump controller shall be UL Listed and FM Approved.
 3. The jockey pump controller shall have as a minimum but not limited to the following alarms:
 - a. Power Failure
 - b. Phase Reversal
 - c. Pump Running
- F. The jockey pump shall have as a minimum but not limited to the following standard features:
 1. Horsepower rated disconnect switch, fuse block and fuses.
 2. Horsepower rated motor contactor and overload relay.
 3. Minimum run timer to prevent short cycling of pump.
 4. HAND-OFF-AUTO selector switches to allow manual operation of the pump.
 5. 0-300 psi pressure switch suitable for freshwater applications.
- G. Packaged Fire Pumping System Skid Base
 1. All the equipment including but not limited to fire pump, diesel engine driver, jockey pump and motor, valves, instrumentation and controls shall be mounted on a common steel base of open frame construction to form a complete and operating pumping system. Peripheral structural members shall be from channel or wide flange beam ASTM 36. Internal structural members shall be from channel or rectangular tubing ASTM 36, all welded per the AISC Manual of Steel Construction, part 4, "Welded Joints". Provisions shall be made in the station base for loading and offloading and handling the station at the site. Lift eyes shall be designed to eliminate trip hazard once the station has been set in place.
 2. The installing contractor shall set the packaged fire pump system on a contractor supplied concrete slab that extends a minimum of 12-inches beyond the packaged fire pump skid on all four sides. All piping penetrations shall enter and exit the packaged fire pump system through the exterior walls of the packaged fire pumping system enclosure. Once the packaged fire pump system is leveled and all piping and electrical connections are made, the installing contractor shall pour a concrete floor inside the building. The Packaged Fire Pumping System manufacturer shall include two (2) NPT threaded drain piping connections through the structural steel perimeter beams of the skid. The installing contractor shall be responsible for installing a minimum of two (2) floor drains in the concrete floor and piping them through the perimeter I-Beam structure to daylight. The concrete floor shall be sloped as required to facilitate proper drainage to the contractor provided and installed floor drains. Once the concrete floor has cured the installing

contractor shall fill the fire pump base and the diesel engine base with non-shrink grout. The perimeter structural support I-Beams shall be taller than the interior structural support members and all equipment mounting elevations shall be placed appropriately so as not to interfere with the installation of the concrete floor and the equipment base grout installation.

H. Piping

1. All piping shall be constructed from ASTM A53, grade B, type E standard weight pipe. The package piping shall consist of grooved fittings and couplings in and out of the pumps. All piping shall be sized per NFPA 20 2020 edition, table 4.26(a). Qualification of the welding procedures and performance of the welders shall comply with the requirements of ASME code, Section IX. All piping valves and fittings shall be in accordance with NFPA 20 2020 edition. Supports shall be provided for all suction and discharge piping. All pipe supports shall be designed to allow for the removal of any individual sections without adding additional stress to adjoining sections or pumps.

I. Fire Pump Fittings

1. Fire pump fittings shall include at a minimum the following: an automatic air release valve, discharge pressure gauge (3.5 inch dial) supplied and sized per NFPA 20.
2. All piping shall be sized per NFPA 20 2020 edition Table 4.26(a).
3. Valves shall be UL and ULC listed and FM approved, with 175-psig minimum pressure rating. Valves shall have 250-psig minimum.
4. Where the suction pipe and pump suction flange are not of the same size they shall be connected by an eccentric tapered reducer or increaser installed in such a way as to prevent air pockets.
5. A listed grooved style check valve shall be installed in the discharge piping. Valve shall comply with UL 312 unless noted.
6. A listed indicating butterfly valve shall be installed on the fire protection side of the pump discharge check valve.
7. All drains shall be piped to a common point for connection to an installer provided and field installed floor drain per NFPA 20 2007 edition.

J. Fire Pump System Accessories

1. Hose Valve Test Header Piping Assembly: System shall be equipped with hose valve header and valves. The hose valve header shall be sized per NFPA 20 2020 edition Table 4.26(a). Hose valve header shall be manufactured from cast iron or fabricated from ASTM A53 standard weight pipe. The test header shall be equipped with listed valves and the number and size of hose valves for testing shall be as specified in Table 4.26(a). Hose valves shall be listed, 2-1/2" National Standard Thread, equipped with caps and chains unless otherwise specified. The hose valve header shall be equipped with a listed butterfly isolation valve that will remain closed during normal and standby operation modes. Hose header shall be fitted with a ball drip valve to prevent freezing after testing and a minimum 3/4" drain piped to a common discharge point.
2. Main Relief Valve Piping Assembly: Where a total of 121 percent of net rated shutoff (churn) pressure plus the maximum static suction pressure, adjusted for elevation, exceeds the pressure for which the system components are rated a pressure relief valve shall be installed. The pressure relief valve shall be located between the pump and the pump discharge check valve and be installed so it can be readily removed for repairs without disturbing the piping. The pressure relief valve shall be a spring loaded or pilot-operated diaphragm type valve. The relief valve shall discharge into an open pipe or into a cone or funnel secured to the outlet of the valve. If a closed type cone is used, it shall be provided with a means for detecting motion of water through the cone. The pressure relief valve shall be UL Listed and FM Approved.
3. Flow Meter Loop Piping Assembly: System shall be equipped with a flow meter loop sized in accordance with NFPA 20 2020 edition Table 4.26(a). The metering device shall be of the venturi type with grooved connections and installed per the manufacturer's directions. The flow meter loop shall be complete with flow meter, and isolation butterfly valves that will remain closed during normal and standby operation modes.
4. The flow meter piping shall be piped to the skid edge for return to the adjacent ground level water storage tank.

K. Painting:

1. The Packaged Fire Pumping System Manufacturers standard Factory Coating System shall be provided in compliance with ISO 12944 Category C2 (Applications: heated or unheated buildings with clean atmospheres and where some condensate may occur).

PART 3 - PACKAGED PUMPING SYSTEM ENCLOSURE

3.1 System Enclosure:

- A. The entire packaged fire pumping system shall be installed inside an environmental enclosure to protect it from the elements. The enclosure shall be complete as specified herein including shop wiring, piping and testing of the equipment furnished under these equipment specifications. The enclosure shall be mounted on the Packaged Fire Pumping System's structural steel skid base at the manufacturer's facility prior to shipment.
- B. The environmental enclosure shall be by Engineer Pre-Qualified and Approved manufacturer. Refer to specification section 1.3 for Pre-Qualification requirements.
- C. The enclosure shall be the manufacturer's standard design that meets or exceeds the site design conditions. The enclosure shall have an open floor with perimeter frame and structural members with provisions for bolting to the structural steel packaged fire pumping system skid. A means for lifting the assembled enclosure without damage to the enclosure using overhead rigging shall be provided.
- D. Arrangement: The Packaged Fire Pumping System Manufacturer shall arrange the equipment furnished under these equipment specifications to allow proper access to the components for operation and maintenance. The minimum headroom in all walkways shall be 7'-0". The enclosure shall be completely assembled and installed on the Packaged Fire Pumping System skid at the manufacturer's assembly plant, with all the accessories listed in this specification fully installed, wired, and tested prior to shipment to the job site, including the fire pump equipment, disconnect switches, panel board(s) and transformer(s), lighting, light switches and receptacles required to make a complete and operating system.
- E. Design Criteria:
 1. All enclosures shall be designed in accordance with the applicable sections of the latest edition of the International Building Code and conform to ASCE (American Society of Civil Engineers) "Minimum Design Loads for Buildings and other Structures".
 2. Each enclosure shall be designed for the following loads, in addition to the stationary weight of the enclosure. Reduction of loads due to tributary loaded areas will not be permitted.
 3. The vertical live load of the enclosure shall not be less than 40 pounds per square foot applied on the roof.
 4. The horizontal wind load of the enclosure shall not be less than 110 MPH and shall be distributed and applied in accordance with the applicable edition of the International Building Code and ASCE.
 5. The enclosure shall be designed to resist the effects of seismic ground motions in accordance with IBC standards.
 6. All combining and distributing of auxiliary equipment loads imposed on the enclosure system shall be done in accordance with the applicable section of the ASCE.
 7. Upon request, the selected enclosure manufacturer shall provide the enclosure purchaser with a complete design certification signed and sealed by a registered professional engineer. If requested, this documentation is typically provided after the manufacturing of the enclosure is complete and will be provided as part of the IOM Manual.
- F. Modular Panel Construction:
 1. All enclosures shall be constructed with prefabricated wall and ceiling panels formed to exact size. All panels to be constructed with die-formed interior and exterior metal pans securely fastened to a perimeter frame of kiln dried spruce-pine-fir (SPF) specie, #2 grade lumber. Perimeter frame to feature tongue and groove profile for positive alignment and sealing and shall utilize pressure treated lumber. Panels shall be filled with poured-in-place urethane, which securely bonds to metal pans and perimeter frame creating a rigid structural panel with a tough, resilient, shock-resisting surface. Standard panels shall be interchangeable for ease of assembly. Special panels (if required) shall be manufactured to the size required to obtain the specified building size.

G. Panel Fasteners

1. Cam-lock fasteners provide a tight and positive seal. These fasteners reduce installation time to a minimum. Fastener material shall be steel housing, hook and pin with high-pressure die-cast zinc cam. A hardened steel hexagonal wrench is provided to tighten panel fasteners. The hook of the fastener shall engage over the pin when rotating the wrench and with cam-action, draw the panels tightly together. Polyethylene snap-in caps cover the wrench holes. Lock spacing shall not exceed 48" on center.

H. Panel Gaskets

1. Each joint shall exhibit a polyvinyl chloride (PVC) bulb type; compression gasket to eliminate water vapor permeability. All gaskets are factory installed and require no additional handling. Gaskets shall be resistant to chemical corrosion and ultraviolet radiation. Gasket operating temperature shall be -34 degrees C to +71 degrees C (-30 degrees F to +160 degrees F).

I. Insulation

1. Insulation shall be 100% rigid urethane with a conductivity factor (K factor) not to exceed 0.128 Btu/hr. Urethane is to be poured in place with a density of 2.2 pounds per cubic foot. Overall coefficient of heat transfer (U factor) and R value to be as follows:

	THICKNESS	"U" FACTOR	"R" VALUE
Wall Panels	3 - 1/2"	.036	28
Roof Panels	5"	.025	40

- a. This insulation shall be a listed urethane with a rating of no more than 25 for flame spread and 450 for smoke developed per ASTM E84. This urethane will also meet the ignition properties requirements of ASTM D-1929.

J. Panel Finishes

1. Interior and Exterior metal pans shall be nominal 24 gauge galvanized steel conforming to ASTM A-653 specifications with the galvanized coating conforming to G60 standards. Minimum yield strength of the panel material shall be 50,000 PSI. The interior finish shall be white embossed and the exterior finish shall be Owner's preference, based on the manufacturer's standard exterior finishes. Panel finish shall be factory applied coating of 0.9 to 1.1 mils of dry film thickness.
2. The finish coat shall be a baked-on siliconized polyester formulation that will meet the following performance standards after 10 years continuous exposure in "normal" atmospheric conditions not containing corrosive fumes such as chemicals or salt spray.
3. Panel finish shall show no evidence of blistering, peeling, or chipping.
4. Panel finish shall not show surface chalking in excess of the No. 4 rating D659 as established by the American Society of Testing Materials (ASTM).
5. Panel finish after cleaning, shall not show color change in excess of 7 NBS units when measured in accordance with the ASTM D-2244 standard.
6. The above performance standards shall not apply where panels have been damaged by fire, radiation or other physical damage.

F. Roof System

1. A prefabricated roof system shall be provided for the enclosure to provide a waterproof covering for insulated ceiling panels.
2. The roof system shall be a galvanized standing seam, 22 gauge, 16 inches wide, sheet metal over ceiling panels with a slope of 1/4" per foot. Fasteners shall be corrosion resistant rubber washered tek screws with length and strength required for the metal to be securely fastened.

G. Wall Panel Design

1. Exterior wall panels of the enclosure shall be a single continuous length from the steel skid to the roof panel of the enclosure and at the side walls and the end walls of the enclosure except where interrupted by wall openings.

2. Wall panels shall be fastened from the interior through a steel plate in the skid with 3/8" diameter electro-galvanized lag bolts. The fastening system shall be designed so that no wall fasteners are exposed on the exterior surface of the walls.
- H. Enclosure Roof Assembly
1. Each enclosure roof shall have 1/4" pitch in enclosure width. Roof panels shall have interlocking tongue and groove connections and shall be attached to the wall through factory pre-drilled holes with 3/8" corrosion resistant fasteners and an interior angle fastened to the walls and top panels. The roof system shall include a factory manufactured "J" rail at the low side wall. The "J" rail shall be nominal 18 gauge galvanized steel.
 2. Transmission of horizontal wind loads across the enclosure shall be made through the panel roof system and no separate roof or wall diagonal bracing shall be required.
 3. Structural frame wind belts and wind bents shall not be required for proper transmission of lateral winds loads.
- I. Hollow Metal Doors
1. All doors shall be 1-3/4" thick flush-type. Door panels shall be nominal 18 gauge cold rolled steel reinforced by lamination to a polystyrene core enclosed with 16 gauge end channel. The hinge reinforcements shall be nominal 7 gauge and the lock reinforcements shall be nominal 16 gauge.
 2. Door frames shall be 4-3/4" deep double rabbited type of nominal 16 gauge cold rolled steel.
 3. Door and frames shall be factory painted with one coat of baked on primer and one coat of baked on epoxy finish paint coating. All doors shall be pre-assembled in their frames and hardware installed and tested prior to shipment.
- J. Door Hardware
1. Door hardware shall consist of:
 - a. 3-4-1/2" x 4-1/2" standard weight, plain bearing hinges per ANSI A5133 630 stainless steel finish with non-rising pins.
 - b. 3-1/2" wide x 1" high extruded aluminum threshold (Out Swing).
 - c. 3/16" x 5/16" silicone rubber weather-stripping.
 2. Deadbolt lockset per ANSI Grade 3, LSD-01 Series, stainless steel finish.
 3. Keyless passage knob set shall be Grade 2, ANSI F75-2, stainless steel finish.
 4. Door closer is certified to conform to ANSI 156.4 Grade 1 and meets exterior barrier free codes in 689 aluminum powder coat finish.

3.2 Enclosure Accessories:

- A. Electrical
1. All above grade wiring shall be installed in surface mounted EMT conduit installed per NFPA 20 2020 edition and the latest edition of NEC. All conduit installed below grade shall be hot dipped rigid conduit. Flexible liquid-tight conduit 18" maximum length shall be permitted at equipment and enclosure connections.
 2. System to be equipped with a single point power connection with terminal strip for distribution to all electrical equipment. Enclosure shall be NEMA 12 rated
 3. Power Supply: The pump station manufacturer shall provide an auxiliary power transformer if required. The transformer shall be mounted and wired on the skid. It shall deliver 240/120 volt single phase power to its distribution panel sized to support all building loads without overloading. Transformer shall dry type shielded type enclosed in a NEMA 3R rated enclosure. The transformer shall be UL listed and comply with the latest edition of NEC.
 4. Lighting: The module shall be equipped interior, exterior and emergency lighting per NFPA 20 2007 edition and installed per the latest edition of the NEC.
 - a. Interior lighting: The enclosure shall be equipped with a minimum of two (2) ceiling mounted LED wrap around type fixtures. The lighting levels shall be as recommended by the I.E.S. (Illuminating Engineering Society). The light fixture shall be rated for damp and dusty applications. The fixture shall be UL Listed.
 - b. Exterior lighting: The enclosure shall be equipped with a minimum of one (1) exterior lighting fixture per

- door. The fixture shall be of the LED type with photoelectric automatic dusk to dawn control. The fixture shall be UL Listed.
- c. Emergency Lighting: The enclosure shall be equipped with emergency lighting. The fixture shall provide a minimum of 90 minutes of illumination and be powered by a maintenance free lead-calcium battery.
- 5. Receptacles: The manufacturer shall furnish and install 120 volt wall mounted convenience outlets. The outlets shall be located in an accessible area of the enclosure. The outlets shall be of the GFCI (ground fault circuit interrupting) type. The outlets shall be UL Listed.
- B. Heating and ventilating
 - 1. Sizing of the fans, louvers and heaters shall be supported by calculations per NFPA 20 2020 edition.
 - 2. The enclosure shall be equipped with a thermostatically controlled electric space heater capable of maintaining a minimum of 40 deg F per NFPA 20 2020 edition. The heater shall be wall or ceiling mounted, and fan forced with adjustable outlet louvers.
 - 3. Ventilation shall be provided for the following functions:
 - a. To control the maximum temperature to 120 deg F (49C) at the combustion air cleaner inlet with the engine running at rated load.
 - b. To supply air for engine combustion.
 - c. To remove any hazardous vapors.
 - d. To supply and exhaust air as necessary for radiator cooling of the engine when required.
 - 4. Exhaust Fan: The enclosure shall be equipped with a high capacity, direct drive propeller wall mounted fan. The fan shall come complete with wall collar, rear guard and exhaust damper. The fan shall be controlled by a wall mounted thermostat. The fan shall meet NFPA 20 2007 edition and be UL listed and OSHA compliant.
 - 5. Inlet louver: The enclosure shall be equipped with electric actuated, center pivot damper with bug screen mounted on the enclosure exterior. The louver shall be 120/1/60V powered closed, spring open and fail in the open position, fast acting, two position and shall be UL Listed and OSHA compliant. The louver shall be interlocked with the diesel engine controller to open upon engine starting.
- C. Testing:
 - 1. The fire pump will be factory performance tested in accordance with the requirements of NFPA, UL and FM. The fire pump and jockey pump controllers will be electrically tested prior to shipment. Additionally, the entire package system will be hydrostatically tested at the factory at a pressure rating per NFPA 20 Section 11-1.1 for a minimum of 2 hours. A copy of the test procedures shall be provided upon request.
 - 2. All packaged/assembled fire pump system shall be certified by a qualified testing laboratory and comply with NC General Statute §§ 66-25.

PART 4-EXECUTION

4.1 INSTALLATION

- A. Place, assemble, install and place into operational readiness the complete packaged fire pumping system and system enclosure as specified in this section, in accordance with manufacturer recommendations, Drawings, FM and NFPA 20 2007 edition.
 - 1. FIELD QUALITY CONTROL
 - a. Manufacturers field representative shall supervise the installation of all items and equipment as specified in this section as needed.
 - b. The Contractor shall inspect the jobsite conditions 72 hours before shipment of the packaged fire pumping system to ensure the site is ready and the site conditions are compatible with the specified system layout.
 - c. Manufacturers field representative shall conduct and document field acceptance tests and startup of the equipment specified in this section and shall ensure conformance to acceptance requirements of NFPA 20 2020 edition and FM Data Sheet 3-7N/13-4N.

- d. Manufacturer's representative shall instruct Owner's personnel in proper system operation and maintenance.
- e. Manufacturer's representative shall commission equipment and certify to Owner in writing that all installation, maintenance instruction, tests, adjustments, repairs and startup are complete and that all components are ready for continuous operation.

4.2 START UP AND COMMISSIONING

- A. The system manufacturer or his representative shall provide commissioning of the complete packaged fire pumping system. The commissioning shall include verification of the proper installation by the installing contractor, system check out, adjustment and complete start-up. The commissioning will occur only when all hook-ups, tie-ins and terminations have been completed and signed off on the manufacturer's start-up request form by the installer.
- B. The commissioning will require the system manufacturer or his representative to provide on-site training for the Owners personnel on the operation and maintenance of the packaged pumping system.

4.3 TRAINING

- A. After the equipment start-up and field testing is complete, the system manufacturer or his representative shall provide instructional training.
- B. Provide training, operation, and maintenance and trouble-shooting instruction to the owners operations and maintenance staff.
- C. Provide instruction for a minimum of (1) hour.
- D. Provide minimum 14-day notice prior to start-up and training.

END OF SECTION 213000

SECTION 220500 – PLUMBING GENERAL PROVISIONS

A. GENERAL

1. SCOPE OF WORK

- a. The Contractor shall provide all materials, equipment and labor necessary to install and set into operation a complete plumbing system as shown on the engineering drawings and as specified herein.

2. QUALITY ASSURANCE

- a. See the General and Supplementary General Conditions.
- b. All work shall be in accordance with State Code and Underwriter's Regulations. Minimum requirements shall be the State Plumbing Code.
- c. Wherever the words "Approved", "Approval", or "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- d. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- e. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days before the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted. Section 01600 of the General Conditions will be followed for substitutions after award of the contract.

3. SUBMITTALS

- a. See General and Supplementary General Conditions.
- b. Within twenty days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit to the Architect/Engineer for approval a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval
- c. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as

well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number, and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.

- d. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent upon receipt of these as-built plans.
- e. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions as outlined in Paragraph C, (Execution), Item #6, of this specification section.
- f. The Contractor shall submit to the Owner all certificates required for operating the system in compliance with the plans and specifications.

4. PRODUCT DELIVERY, STORAGE AND HANDLING

- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- b. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

5. WORK CONDITIONS AND COORDINATION

- a. The Contractor shall review the electrical plans to establish points of connection and the extent of electrical work to be provided in his Contract. A licensed electrician shall perform all electrical work.
- b. Electrical work shall be in accordance with State codes, and as specified in Division 16 contained herein.
- c. Pipe chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- d. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.

6. GUARANTEE

- a. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall

apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturers warranty period.

- b. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the final acceptance of the work and shall replace such defective materials or workmanship without cost to the owner.
- c. Additionally, the contractor shall guarantee materials and workmanship against latent defects arising from faulty materials, faulty workmanship or negligence which is hidden or not readily apparent to the owner at the time of final acceptance and which is discovered by the owner within six (6) years following final acceptance of the work. The contractor shall replace such defective materials or workmanship without cost to the owner.

B. PRODUCT

- 1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Material and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2. The Contractor shall provide nameplates for identification of all equipment, switches, panels, etc. The nameplates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core. Nameplates shall be fastened with pan head tapping screws.

C. EXECUTION

1. INSPECTION

- a. This Contractor shall examine the areas of completed work and shall insure that no defects or errors are present which would result in the poor application or installation of subsequent work.

2. INSTALLATION

- a. All work shall be performed in a manner indicating proficiency in the trade.
- b. All pipes shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- d. All finishing shall be by the General Contractor.

- e. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish all sleeves to the General Contractor for openings through poured masonry floors or walls, above grade, required for passage of all pipes required to support his equipment.
- f. All fixtures shall be accurately roughed in according to the manufacturer's installation dimensions so that no offset adaptors, flexible connections or other improvising are necessary. All incorrect work shall be torn out and corrected and walls and floors patched.
- g. Connections to cold water, soil and waste lines shall be made at locations shown on the Drawings.

3. PERFORMANCE

- a. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.
- b. Rock excavation shall be defined in the Supplementary General Conditions. Unless specifically stated, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

4. ERECTION

- a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

5. ADJUST AND CLEAN

- a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for intended service. In no event shall nameplates be painted.
- c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract.

6. MAINTENANCE AND OPERATING MANUAL

- a. The Contractor shall prepare four (4) copies of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:

- i. Index and page numbers.
 - ii. Certificate of substantial completion.
 - iii. A summary sheet of warranties with the dates noted and a copy of all warranties.
 - iv. List of all subcontractors and suppliers with names, addresses and phone numbers.
 - v. Certified testing and balancing report.
 - vi. All submittal data and shop drawings.
- b. The O & M manuals shall be installed in 3 ring heavy back note books with the name of the building and the words, "Operations and Maintenance Manuals" permanently affixed to the cover and spine.
- c. The operating and maintenance manuals shall be submitted to the Engineer (2) weeks before the pre-final inspection, for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

END OF SECTION 220500

SECTION 220513 – ELECTRICAL WORK IN PLUMBING CONTRACT

A. GENERAL

1. This Contractor shall be responsible for the entire control system and control connections to all equipment installed as part of his contract.
2. Wiring from disconnect switches, junction boxes, panelboard circuit breakers, etc. up to plumbing equipment shall be by the electrical contractor. Refer to details on plans for connections to equipment from starter/disconnects.
3. All power and control wiring shall be in conduits.
4. All electrical work shall be performed by a licensed electrician.
5. All electrical work shall be in accordance with the State Building Code and all its supplements and the latest edition of the National Electrical Code.

B. PRODUCT

1. All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
2. Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
3. All conductors and conduits shall be sized as noted on the plans or as required per NEC.

C. EXECUTION

1. All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
2. Control wiring electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid- Tite" conduit. Connection to other equipment shall be made with rigid conduit.
3. Control wiring conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 220513

SECTION 220523 – PLUMBING VALVES

A. GENERAL

1. Valves shall be installed where indicated or required.
2. Insofar as possible, all valves shall be by the same manufacturer.
3. All valves stored on project site shall have ports closed.
4. Valves shall serve dual functions as shut-off and balancing valves.
5. Valves shall have an adjustable set point with locking mechanism which will permit closing of the valve and reopening of the valve to the previously determined set point.

B. PRODUCT

1. Isolation/Shutoff valves up to and including 3" in line size shall be full port, forged brass ball valves with threaded ends, Watts Series FBV-1 or approved equivalent.
2. Isolation/Shutoff valves 4" and larger shall be full port, 125# class, epoxy coated cast iron, flanged ball valves suitable for potable water service, FDA approved, Watts Series G-4000-FDA or approved equivalent
3. Provide stem extensions, as necessary, to accommodate piping insulation.

C. EXECUTION

1. All flanged connections shall be gasketed.
2. In no case shall raised face flanges be bolted to flat face flanges.
3. All valve stems shall be accessible and in no case shall valve stems be installed below horizontal.
4. The Contractor shall set in service all valves to operating conditions as part of his Contract.
5. The contractor shall provide 1" diameter brass valve tags for all valves.
6. The contractor shall provide ceiling markers for ceilings above lay-in ceiling.
7. The contractor shall provide a framed valve chart.

END OF SECTION 220523

SECTION 220529 – PLUMBING HANGERS AND SUPPORTS

A. GENERAL

1. This Section includes all hangers and supports, etc. as may be required to provide a complete piping system.
2. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.
3. Refer to specification Section 15110 for piping.

B. PRODUCT

1. Piping shall be as stated in Piping Section(s).
2. Hangers and supports shall be as manufactured by B-Line Systems, Inc., PHD Manufacturing, Empire, or Modern Support Devices.

C. EXECUTION

1. In no case shall this Contractor be allowed to cut or reduce the specified covering to allow the application of a smaller hanger than required.
2. Hangers shall be spaced as dictated by North Carolina Plumbing Code.
3. Hangers shall be provided at each change in direction.
4. Vertical risers shall be supported at each floor, 5 feet on center, and/or at changes in direction of pipe.
5. Do not support piping from bar joist bridging and/or roof deck.

END OF SECTION 220529

SECTION 220553 – IDENTIFICATION OF PLUMBING COMPONENTS

A. GENERAL

1. This section includes insulation for piping and equipment, as shown on the plans.
2. All coverings, and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50.

B. PRODUCT

C. EXECUTION

1. EQUIPMENT

- a. All water heaters shall be identified with equipment identification, equipment controlled, electrical ratings and date of installation.
- b. Equipment shall be clearly identified with engraved phenolic plates securely fastened to the equipment with sheet metal screws. Phenolic plates shall be white background and black lettering.
- c. All serviceable equipment located above ceilings or other concealed spaces shall clearly identified on an adjacent finished surface below service space. Label shall be engraved phenolic plate with white background and white letters. Label shall list name of equipment.

2. PIPING AND VALVES

- a. Valve Identification
 - i. Project specific equipment
 - ii. All valves shall be tagged brass valve tags with chains for isolation and control valves.
 - iii. Provide valve tag chart in the O&M manual.
 - iv. Provide famed valve tag chart with lexan cover mounted in each mechanical room. Chart shall include all valves in that room.
 - v. Include the tag numbers in the as-built drawings.
 - vi. Provide ceiling marker for isolation valves about lay-in ceilings.
- b. All piping shall be provided with identification in accordance with ANSI A13.1-1981 standards. Markets shall be fully legible from floor level showing medium contained pipe, and direction flow. Stenciling as indicated below will be acceptable in lieu of markers.
- c. Locate pipe markers and flow arrows as follows:

- i. Maximum of 10ft and closer if congested.
 - ii. Near each valve
 - iii. Near each branch take off.
 - iv. Near equipment.
 - v. Near origination and termination points
 - vi. Near where pipe passes through walls (both sides of wall)
 - vii. Near access doors
 - viii. On piping above inaccessible ceilings as it enters and immediately after it exits.
- d. All exposed piping in mechanical rooms shall be painted and marked as listed below:

Piping System	Color	Sherwin Williams Number	Lettering
Dom. Cold Water	Dark Blue	SW6965	CW
Dom. Hot Water	Light Red	SW6868	HW
Dom. Hot Water Return	Light Red	SW6868	HWR
Natural Gas	Yellow	SW6911	GAS

- e. Pipe identification shall contrast in color to the pipe colors and be easily readable. The width of color bands should be equal to the size of the stencil indicated below.

END OF SECTION 220553

SECTION 220700 – PLUMBING INSULATION

A. GENERAL

1. The Contractor shall insulate hot water supply and return, and cold water piping as specified below.
2. All insulation, linings, coverings and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50, except for exposed outside piping.

B. PRODUCT

1. All hot and cold water piping (unless otherwise noted) shall be insulated with 1" thick fibrous glass materials with factory applied cover. All hot and cold water piping located in unconditioned spaces shall be insulated with 1 1/2" thick fibrous glass materials with factory applied cover. Cover shall be embossed vapor barrier, laminated with pressure sealing cap adhesive.
2. Closed cell insulation, of equal R-value may be used in lieu of fiberglass where concealed in walls. Insulation joints are to be sealed per manufacturer's recommendations. Taped joints will not be accepted. Insulation shall be finished with a fire retardant coating to attain proper fire rating.
3. All exposed piping in finished areas and equipment spaces shall have an additional layer of Kraft paper with vapor sealing tape followed by 8oz. /sq.yd. canvas cloth wrap, glued with two coats of sizing. Canvas shall be coated twice with Foster fireproof lagging to assure flame and smoke spread ratings.

C. EXECUTION

1. Insulation shall be installed in accordance with manufacturer's recommendations.
2. All exterior piping insulation above grade shall be provided with a protective aluminum jacket with a factory-applied asphalt and Kraft paper moisture barrier. Aluminum jackets shall be cross-ripped (longitudinally corrugated) for strength. Aluminum jackets shall be not less than 0.106" thick and shall be secured with aluminum or stainless steel screw; not more than 8" apart.
3. All piping exposed outdoors shall be wrapped with electric trace before insulation is applied.
4. Any pipe covered prior to leak testing shall be exposed at contractor expense.
5. All piping shall be provided with identification in accordance with ANDI A13.1-1981 standards. Markers shall be located at each wall, floor, and ceiling penetration, and at every 25ft (10 feet in mechanical rooms). Markers shall be fully legible from floor level

showing medium contained in pipe, and direction of flow. Wording on markers shall be as follows:

- a. “Domestic Cold Water Supply”.
 - b. “Domestic Hot Water Supply”.
6. Provide sheet metal saddle at each hanger. Provide wood blocking at each saddle.

END OF SECTION 220700

SECTION 221000 – PLUMBING PIPE AND FITTINGS

A. GENERAL

1. This section includes all pipe, pipe fittings, hangers, and supports, etc. as may be required to provide a complete water plumbing system.
2. The actual arrangement of the piping shall follow the general locations shown on the drawings, such that clearances, line drainage, etc. shall be maintained.

B. PRODUCT

1. Domestic Water Pipe and Pipe Fittings
 - a. Copper Pipe
 - i. Water piping above grade shall be Type “L” hard drawn copper. Water piping below grade shall be Type “K” soft drawn. Pipe shall conform to ASTM B-88 Specification.
 - ii. Water piping fittings shall be sweat or grooved type wrought copper conforming the ANSI-B16.22, ASME B16.18, or ASTM B584 Specification.
 - iii. Use silver solder on all piping.
 - iv. All piping systems shall be hydrostatically tested at 150 psi for a period of 48 hours without loss of pressure. Any leaks that occur shall be repaired and another test started.
2. Storm, Sanitary Waste and Vent Pipe and Pipe Fittings
 - a. Cast Iron Pipe
 - i. Building sanitary sewer and storm line below grade shall be service weight cast iron, with hub and spigot type joints, with neoprene “Charlotte” seal.
 - ii. Building sanitary sewer, storm, and vent lines above grade shall be cast iron with no hub joints with stainless steel bands.
 - iii. Cast iron fittings to conform to piping specifications.
 - iv. Waste pipe shall be tested at each floor. A test tee will be installed below each floor and pipe will be filled with water for a height of 10’ above finished floor. The pipe shall be gas and water tight. Water shall stand in the system for a period of 3 hours without evidence of leakage.
 - v. Horizontal roof drain leaders above grade shall be insulated with 1” fiberglass.

- vi. Waste piping, above ceilings, from floor drains shall be insulated with 1" fiberglass.
- b. PVC Pipe
 - i. Building sanitary sewer and storm lines below grade shall be schedule 40 PVC-DWV conforming to ASTM D-2665-68.
 - ii. Building sanitary sewer, storm, and vent lines above grade shall be schedule 40 PVC-DWV conforming to ASTM D-2665-68.
 - iii. PVC fittings to conform to piping specifications.
 - iv. Joints for PVC piping shall be made using the piping manufacturer's approved solvent cement.
 - v. Waste pipe shall be tested at each floor. A test tee will be installed below each floor and pipe will be filled with water for a height of 10' above finished floor. The pipe shall be gas and water tight. Water shall stand in the system for a period of 3 hours without evidence of leakage.
 - vi. PVC piping is not permitted in return air plenums.
 - vii. PVC piping is not permitted for dishwasher waste. Cast iron piping is to be used.

C. EXECUTION

1. Sleeves shall be provided wherever pipes pass through walls, floors, and ceilings. Sleeves shall be Schedule 40, black steel, 1/2" in diameter larger than the pipe or insulation on the pipe. Sleeves through floors shall be caulked and made watertight.
2. In pipe chases, the Contractor shall provide for suspension of all piping from the structure. Do not allow piping to rub against masonry when expanding and contracting.
3. Close and protect open ends of piping until final connections are made. Such closing shall be made with fittings which cannot be easily removed. Caps or plugs shall be required at all times during construction so that no pipes are left open at the end of any day's work, even though continuation is expected the next day.
4. All piping and equipment installed under this Contract shall be tested in the presence of the Engineer or a designated representative of the Owner, and the proper Plumbing Inspector, proved tight for the periods stated above, or longer if required by the Inspector. Engineer shall be given 48 hour written notification of all tests.
5. No plumbing system or part thereof shall be covered or concealed until after it has been tested and approved. If such work has been covered or concealed before testing, it shall be exposed for testing.

6. All water piping shall be sterilized with chlorine, 50 milligrams per liter, and held for a 24-hour period, after which the system shall be flushed prior to being put into service. During the flushing of the system, all flush valves shall be thoroughly flushed out to insure the removal of sediment, pipe dope, etc., from water lines and flush valves, removing such working parts of the flush valves as may be deemed necessary. The system shall be drained and flushed sufficiently to provide chlorine residue of 0.2 ppm or less. The Contractor shall engage an independent laboratory to conduct bacteriological and post-chlorination test certifying that the water meets quality of the drinking water. Certification of bacteriological testing for quality of the domestic water shall be conducted, accepted by the Project Engineer, and submitted to the State Construction Office prior to request for final inspection and/or Beneficial inspection.

END OF SECTION 221000

SECTION 221119 – PLUMBING PIPING SPECIALTIES

A. GENERAL

1. This section includes miscellaneous items required for a complete plumbing system.

B. PRODUCT

1. Escutcheons shall be chrome plated, spring type, on all pipes passing through walls and ceilings in finished areas. Floor escutcheons shall be cast brass, chrome plated, with set screw.
2. Stops shall be compression type, chrome plated, angle or straight way pattern on all fixtures, hot and cold water supply. On service sinks, use brass gate valve as specified.
3. Flashing for vents through the roof shall be two-piece type, 16 ounce copper counter flashing and base flashing, or a two-piece type, 4 pound lead counter flashing and base flashing. The base flashing shall be installed by the General Contractor with the roof system.
4. Pipe anchors for rough-in use shall be "Rapid Rough" products. Use for anchoring rough-in of all hot and cold water connections for all lavatories, sinks and other wall connected fixtures.
5. Insulating couplings shall be V-line, as manufactured by Walter Vallett or approved equal.
6. Shock absorbers shall be of all stainless steel construction and in conformance with P. D. I. Standard WH201. Shock absorbers shall be installed as noted at the locations shown on the plans and shall be totally accessible. Where there are no shock absorbers noted or shown on the plans, 18 inch air chamber type shock absorbers shall be installed at the hot and cold water supply to each fixture.
7. Unions shall be bronze body with packless brass ground joints. Wrought iron pipe unions shall be malleable iron, ground joint with bronze to iron seat.

C. EXECUTION

1. Escutcheons shall be of sufficient size to cover outside diameter of the pipe or the insulation of the pipe.
2. Vent flashing shall extend down at least 4 inches from the top of the pipe. Flashing shall extend at least 12 inches in all directions from the pipe and shall be parallel to the roof line.
3. Pipe anchors for rough-in use shall be installed to hold pipes securely in alignment, according to the manufacturer's rough-in dimensions. Remove these devices after the wall is built around the pipes.

4. Unions shall be installed as shown on the plans, and where required, to disconnect piping for future replacement or repairs.
5. Dielectric unions shall be installed at hot water heaters and at any junction of dissimilar metal pipes.

END OF SECTION 221119

SECTION 224000 – PLUMBING FIXTURES

A. GENERAL

1. Provide plumbing fixtures as scheduled on the drawings.
2. All fixtures shall be by one manufacturer insofar as possible.
3. Submit shop drawings on the following:
 - a. Fixtures
 - b. Floor drains and cleanouts
 - c. Trim
4. Fixture finishes shall be as specified on plans and confirmed with the Architect.

B. PRODUCT

1. Products approved for use on this shall be as follows:
 - a. Fixtures: Kohler, American Standard, Eljer, Zurn, Toto, Crane
 - b. Stainless steel sinks: Elkay, Just
 - c. Flush Valves: Sloan, Delaney, Zurn
 - d. Floor drains and cleanouts: Zurn, Smith, and Josam.
 - e. Trim: Kohler, American Standard, Eljer, Chicago Faucets, T & S Brass and Bronze, Delta, Symmons, Sloan, Delaney, Stern-Williams, McGuire, Brasscraft, Cambridge Brass, Speakman, Zurn, Moen.

C. EXECUTION

1. Fixtures and carriers shall be installed in accordance with the manufacturer's recommendations.
2. All fixtures, drains, traps, etc. shall be set plumb and level.
3. All handicapped fixtures and trim shall be installed in accordance with the State Building Code, latest edition.
4. Provide trap primer and required piping on all floor drains.
5. All fixtures are to be water saving type.
6. Provide vandal-proof options for all fixtures used by public. This includes screws, aerators, and showerheads.

END OF SECTION 224000

SECTION 230000 – MECHANICAL GENERAL PROVISIONS

A. GENERAL

1. SCOPE OF WORK

- a. The Contractor shall provide all materials, equipment and labor necessary to install and set into operation a complete mechanical systems as shown on the engineering drawings and as specified herein.

2. Quality Assurance

- a. See the General and Supplementary General Conditions.
- b. All work shall be in accordance with State Code and Underwriter's Regulations. Minimum requirements shall be the State Plumbing, Mechanical, Gas, and Energy Code.
- c. Wherever the words "Approved", "Approval", or "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- d. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- e. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer ten (10) days before the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted. The General Conditions will be followed for substitutions after award of the contract.

3. Submittals

- a. See General and Supplementary General Conditions.
- b. Within twenty days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit to the Architect/Engineer for approval a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval
- c. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as

well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number, and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.

- d. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent upon receipt of these as-built plans.
- e. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions as outlined in Paragraph C, (Execution), Item #6, of this specification section.
- f. The Contractor shall submit to the Owner all certificates required for operating the system in compliance with the plans and specifications.

4. Product Delivery, Storage and Handling

- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- b. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

5. Work Conditions and Coordination

- a. The Contractor shall review the electrical plans to establish points of connection and the extent of electrical work to be provided in his Contract. All electrical work shall be performed by a licensed electrician.
- b. Electrical work shall be in accordance with State codes, and as specified in Division 16 contained herein.
- c. Pipe chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- d. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.

6. Guarantee

- a. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall

apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturers warranty period.

- b. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the final acceptance of the work and shall replace such defective materials or workmanship without cost to the owner.
- c. The contractor shall provide a five year compressor warranty for all refrigeration compressors from date of system acceptance.
- d. Additionally, the contractor shall guarantee materials and workmanship against latent defects arising from faulty materials, faulty workmanship or negligence which is hidden or not readily apparent to the owner at the time of final acceptance and which is discovered by the owner within six (6) years following final acceptance of the work. The contractor shall replace such defective materials or workmanship without cost to the owner.

B. PRODUCT

- 1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Material and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2. The Contractor shall provide nameplates for identification of all equipment, switches, panels, etc. The nameplates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core. Nameplates shall be fastened with pan head tapping screws.

C. EXECUTION

- 1. Inspection
 - a. This Contractor shall examine the areas of completed work and shall insure that no defects or errors are present which would result in the poor application or installation of subsequent work.
- 2. Installation
 - a. All work shall be performed in a manner indicating proficiency in the trade.
 - b. All pipes shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.

- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- d. All finishing shall be by the General Contractor.
- e. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish all sleeves to the General Contractor for openings through poured masonry floors or walls, above grade, required for passage of all pipes required to support his equipment.
- f. All fixtures shall be accurately roughed in according to the manufacturer's installation dimensions so that no offset adaptors, flexible connections or other improvising are necessary. All incorrect work shall be torn out and corrected and walls and floors patched.

3. Performance

- a. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.
- b. Rock excavation shall be defined in the Supplementary General Conditions. Unless specifically stated, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

4. Erection

- a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

5. Adjust and Clean

- a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for intended service. In no event shall nameplates be painted.
- c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract.

6. Maintenance and Operating Manual

- a. The Contractor shall prepare four (4) copies of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these

may be included), but shall be prepared to describe this particular job. This manual shall include the following:

- i. Index and page numbers.
 - ii. Certificate of substantial completion.
 - iii. A summary sheet of warranties with the dates noted and a copy of all warranties.
 - iv. List of all subcontractors and suppliers with names, addresses and phone numbers.
 - v. Certified testing and balancing report.
 - vi. All submittal data and shop drawings.
- b. The O & M manuals shall be installed in 3 ring heavy back note books with the name of the building and the words, "Operations and Maintenance Manuals" permanently affixed to the cover and spine.
 - c. The operating and maintenance manuals shall be submitted to the Engineer (2) weeks before the pre-final inspection, for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.
 - d. An electronic copy of the O&M Manual shall be provide on disk or thumb drive.

7. Owner Training

- a. After substantial completion and prior to final acceptance of the project the owner training shall be conducted. The training shall be conducted in a classroom setting with the contractor providing all the necessary personnel, literature, software to walk the owner through all the systems and components used in the project. A separate session shall be conducted for building controls and their proper operation. At the conclusion of each session the owner shall be fully capable of proper operation and maintenance of all systems and their components. All sessions shall be videoed for future reference. Video shall be shared with the owner either on thumb drive or USB device.

END OF SECTION 230000

SECTION 230513 – ELECTRICAL WORK (MECHANICAL)

A. GENERAL

1. This Contractor shall be responsible for the entire control system and control connections to all equipment installed as part of his contract.
2. Wiring from disconnect switches, junction boxes, etc. up to mechanical equipment shall be by this contractor. Final electrical connections to mechanical equipment shall be by this contractor.
3. All power and control wiring shall be in conduits.
4. All electrical work shall be performed by a licensed electrician.
5. All electrical work shall be in accordance with the State Building Code and all its supplements and the latest edition of the National Electrical Code.

B. PRODUCT

1. All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
2. Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
3. All conductors and conduits shall be sized as noted on the plans or as required per NEC.

C. EXECUTION

1. All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
2. Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid-Tite" conduit. Connection to other equipment shall be made with rigid conduit.
3. Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 230513

SECTION 230529 – MECHANICAL HANGERS AND SUPPORTS

A. GENERAL

1. This Section includes all hangers and supports, etc. as may be required to provide a complete piping system.
2. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.
3. Refer to specification Section 15110 for piping.

B. PRODUCT

1. Piping shall be as stated in Piping Section(s).
2. Hangers and supports shall be as manufactured by B-Line Systems, Inc., PHD Manufacturing, Empire, or Modern Support Devices.

C. EXECUTION

1. In no case shall this Contractor be allowed to cut or reduce the specified covering to allow the application of a smaller hanger than required.
2. Hangers shall be spaced as dictated by North Carolina Plumbing Code.
3. Hangers shall be provided at each change in direction.
4. Vertical risers shall be supported at each floor, 5 feet on center, and/or at changes in direction of pipe.
5. Do not support piping from bar joist bridging and/or roof deck.

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION OF HVAC COMPONENTS

PART 1 - GENERAL

- 1.1 This section includes insulation for piping, ductwork, and equipment, as shown on the plans.
- 1.2 All coverings, and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50.

PART 2 - PRODUCT

PART 3 - EXECUTION

3.1 Equipment

- A. All HVAC equipment, including air handlers, fans and pumps shall be properly identified with equipment identification, equipment controlled, electrical ratings and date of installation.
- B. Equipment shall be clearly identified with engraved phenolic plates securely fastened to the equipment with sheet metal screws. Phenolic plates shall be white background and black lettering.
- C. All serviceable equipment (fans, reheat coils, VAV boxes, etc.) located above ceilings or other concealed spaces shall clearly identified on an adjacent finished surface below service space. Label shall be engraved phenolic plate with white background and white letters. Label shall list name of equipment.
- D. Equipment labeling shall be coordinated with owner to match identification used by Building Automaton System.

3.2 Ductwork

- A. Paint all exposed ductwork insulation in mechanical rooms white. Ductwork exposed in finished spaces shall be painted as shown on architectural plans.

Duct System	Color Stencil Identification	Label Color	Lettering Color
Supply Ductwork	SUPPLY AIR	Green	White
Return Ductwork	RETURN AIR	Blue	White
Relief Ductwork	RELIEF AIR	Blue	White
OA Ductwork	OUTSIDE AIR	Blue	White
Exhaust Ductwork	EXHAUST	Yellow	Black

3.3 Piping and Valves

- A. Valve Identification

1. All valves shall be tagged brass valve tags with chains for isolation and control valves.
 2. Provide valve tag chart in the O&M manual.
 3. Provide famed valve tag chart with lexan cover mounted in each mechanical room. Chart shall include all valves in that room.
 4. Include the tag numbers in the as-built drawings.
- B. All piping shall be provided with identification in accordance with ANSI A13.1-1981 standards. Markers shall be located at each wall, floor or ceiling penetration, and at every 20 ft. Markets shall be fully legible from floor level showing medium contained pipe, and direction flow. Stenciling as indicated below will be acceptable in lieu of markers.
- C. All exposed piping in mechanical rooms shall be painted and marked as listed below:

Piping System	Color	Stencil Identification	Label Color	Lettering Color
Natural Gas	Yellow	GAS	Yellow	Black

- D. Pipe identification shall contrast in color to the pipe colors and be easily readable. The width of color bands should be equal to the size of the stencil indicated below.
- E. For insulated pipe systems, stencil sizes are as follows:
1. For pipes up to 1 inch, use 1/2 inch letters.
 2. For pipes 1 inch to 2 inches, use 3/4 inch letters.
 3. For pipes 2 inches to 4 inches, use 1 1/4 inch letters
 4. For pipes 4 inches to 6 inches, use 1 1/4 inch letters.
 5. For pipes above 6 inches, use 4 inch letters.
- F. f. For un-insulated systems, stencil sizes are as follows:
1. For pipe diameters up to 1 inch, use 1/2 inch letters.
 2. For pipe diameters from 1 inch to 2 inches, use 1 inch letters.
 3. For pipe diameters from 2 inches to 6 inches, use 2 inch letters.
 4. For pipe diameters over 6 inches, use 3 inch letters.

END OF SECTION 230553

SECTION 230593 – TESTING AND BALANCING

A. GENERAL

1. SECTION INCLUDES

- a. Testing, Adjusting, and Balancing:
 - i. Air condition equipment, including air distribution devices, supply ducts, air handling units, condensing units, fans, coils, and related equipment.
 - ii. Hydronic systems, including pumps, water distribution systems, chillers, boilers, heat exchangers, coils, and related equipment.
 - iii. 230800 Mechanical Commissioning Requirements.

2. REFERENCES

- a. American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE)
 - i. Standard 111-2008 – Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-conditioning and Refrigeration Systems.
 - ii. Applications Handbook 2019, Chapter 39 – Testing, Adjusting, and Balancing
- b. Testing, Adjusting and Balancing Bureau (TABB) – International Standards for Environmental Systems Balance.
- c. Sheet Metal and Air Conditioning Contractors' National Standards for Total System Balance.
- d. Associated Air Balance Council (AABC) – National Standards for Total System Balance.
- e. National Environmental Balancing Bureau (NEBB) – Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

3. DEFINITIONS

- a. Adjusting: Varying of system flow by modifying settings of dampers and valves, in combination with varying fan speeds to obtain optimum operating conditions for the entire system.
- b. Balancing: Proportioning of air and hydronic flows through system mains, branches and terminal devices using standardized procedures to obtain specified air of hydronic flow while imposing the least amount of restriction on the HVAC system.

- c. Testing: Use of specialized and calibrated instruments to measure temperatures, pressures, rotational speeds, electrical characteristic, air and hydronic flow in velocities or quantities used in evaluating the performance of an HVAC system.

4. COORDINATION

- a. The testing, adjusting and balancing Contractor shall coordinate his work with the mechanical system and temperature control system installing Contractors to accomplish coordination and verification of system operation and readiness for testing, adjusting and balancing.
- b. Coordinate and assist CxP with all verification activities including providing all required sampling data necessary for the commissioning process.

5. SUBMITTALS

- a. Qualification Statements:
 - i. Submit company's certification documents, including:
 - ii. Contractor Certification:
 - 1. Supervisor Certification
 - 2. Technician Certification
 - iii. Submit name of testing agency to Owner within thirty (30) days on Notice to Proceed.
 - iv. Submit list of projects completed by testing agency of similar size, scope and equipment. Include name of Contractor and building Owner contacts.
 - v. Submit a certification letter stating that the TAB agency is an independent entity not owned in part or in whole by any subcontractor employed on the current project.
- b. Reports:
 - i. Deficiency Report: Following examination of installed system, prior to balancing, submit report indicating system deficiencies that would prevent proper testing, adjusting and balancing of systems and equipment to meet specified performance.
 - ii. TAB Report: Submit a copy of the complete testing, adjusting and balancing report to FMC Project Manager and RECS Atlanta Staff Engineer via email when it becomes available. Report shall include any drawings indicating air outlets, thermostats and equipment identified to correspond with data sheets.

1. Reports shall be on TABB/SMACNA (NEBB or AABC), forms that indicate information addressing each of the testing methods, readings and adjustments.
- c. Closeout Submittals:
 - i. Provide complete copy of testing, adjusting and balancing report. Include report in operation and maintenance manual.
6. QUALITY ASSURANCE
 - a. Qualifications:
 - i. Testing and balancing shall be performed by a testing agency who specializes in testing, adjusting and balancing of heating, ventilating, air-moving equipment, air-conditioning systems and hydronic systems, and has a minimum of one (1) year experience.
 - ii. Testing agency shall have successfully completed a minimum of five (5) projects, similar in size and scope.
 - iii. Testing agency shall be a certified member of TABB (AABC and/or NEBB).
 - iv. Maintain a copy of applicable standards at the project site.
 - b. Certifications:
 - i. TAB Technician shall be certified by a nationally recognized certifying agency (AABC and/or NEBB).
 - c. Perform total system balance in accordance with Testing, Adjusting and Balancing Bureau (TABB) – Quality Assurance Program for Environmental Systems Balance, and (AABC National Standards for Field Measurement and Instrumentation and/or NEBB Quality Assurance Program – Conformance Certification).
7. PROJECT CONDITIONS
 - a. Testing, adjusting and balancing shall commence after the HVAC systems installation is complete and in working order. Associated areas of general construction shall be in place including interior and exterior doors, windows, walls, ceilings and existing conditions.
8. SPECIAL WARRANTY
 - a. Provide warranty for period of ninety (90) days following physical occupancy of building, during which time the Owner may request a re-check of up to 10% of total number of terminals, or resetting of any outlet, coil or device listed in the test report. This period of time shall be no longer than 180 days after submission of the completed report.

- b. Warranty shall meet the requirements of the following program(s):
 - i. TABB – Quality Assurance Program
 - ii. AABC – National Performance Guarantee
 - iii. NEBB – Conformance Certification

B. PRODUCTS – NOT USED

C. EXECUTION

1. Prior to commencing testing, adjusting and balancing of environmental system(s), verify the following conditions; if deficiencies are evident, submit Deficiency Report to Engineer. Do not begin testing, adjusting and balancing of environmental system until deficiencies have been remedied.
 - a. Systems are started and operating in a safe and normal condition.
 - b. Temperature control systems are installed, complete, and operable.
 - c. Automatic and manual dampers are operable and fully open.
 - d. Thermal overload protection is in place for fans, pumps, chillers and other equipment.
 - e. Start up air filters are removed.
 - f. Final filters are clean and properly installed.
 - g. Duct and fan systems are clean.
 - h. Fans are rotating correctly.
 - i. Fire and volume dampers are in place and open.
 - j. Air coils fins are cleaned and combed.
 - k. Access doors are closed and duct end caps are in place.
 - l. Air outlets are installed and connected.
 - m. Hydronic systems are pressure tested, flushed, filled and properly vented.
 - n. Leak testing on duct system has been performed in accordance with SMACNA Standards, or as specified.
 - o. Pumps are rotating correctly.
 - p. (Start-up/construction) strainers have been removed and all permanent strainers are clean and in place.
 - q. Gauges and/or test parts are properly located for balancing.
 - r. Service and balance valves are fully open.

2. SITE TOLERANCES

- a. Air Handling Systems: Adjust to within plus 10 percent of outlet total plus allowable leakage rate.
- b. Air Outlets and Inlets: Adjust to within plus or minus 10 percent of design for the space.
- c. Hydronic Systems: Adjust to within plus or minus 10 percent of design flow.
- d. Hydronic Terminal Devices: Adjust to within plus or minus 10 percent of design flow.

3. AIR SYSTEMS PROCEDURE

- a. Adhere to the following procedure:
 - i. TABB – HVAC Testing, Adjusting and Balancing International Standards; with particular focus on the following chapters:
 - 1. Preliminary TAB procedures
 - 2. General air systems TAB procedures
 - 3. TABB procedures for specific (VAV, CAV, Multizone, Dual duct, etc.) air systems
 - ii. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) HVAC Systems – Testing, Adjusting and Balancing.
 - iii. NEBB – Procedural standards for TAB of environmental systems.
 - iv. AABC – National standards for total systems balance.
- b. Minimum air procedures should include the following:
 - i. Test and adjust fan RPM to design requirements.
 - ii. Test and record motor full load nameplate rating and actual ampere draw.
 - iii. Test and record system static pressures, fan suction and discharge.
 - iv. Adjust all main supply and return air duct to within tolerances listed in this section of work.
 - v. Test and adjust each diffuser, grille and register. Reading and tests of diffusers, grilles and registers shall include design velocity (FPM) and adjusted velocity, design CFM and adjusted CFM.
 - vi. Test and record outside, mixed air, and discharge temperatures (D.B. for heating cycle, D.B. and W.B. for cooling cycle).
 - vii. In coordination with the ATC contractor, set adjustments of automatically operated dampers to operate as specified, indicated and/or noted.

- viii. Test and adjust air handling and distribution systems to provide required or design supply, return, outside and exhaust air quantities within design tolerance.
- ix. In air systems employing filters, blank off filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.
- x. Make air velocity measurements in ducts by Pitot tube traverse entire cross-sectional area of duct in accordance with SMACNA equal area method or Log Linear method.
- xi. Measure air quantities at all air inlets and outlets.
- xii. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Vary total system air quantities by adjustments of fan speeds. Provide drive changes recommendations. Vary branch air quantities by damper regulation.
- xiii. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for loading of filters and coils.
- xiv. Adjust outside air automatic dampers. Outside air, return air and exhaust dampers for design conditions within specified tolerances.
- xv. Where modulating dampers or economizers are provided, take and record measurement at full return air, minimum outside air and 100 percent outside are mode of operation.
- xvi. Verify and record, in the T&B Report, “K” factors for all VAV air terminal devices and air flow stations.

4. HYDRONIC SYSTEM PRESSURE

- a. Adhere to the following procedure:
 - i. Testing, Adjusting and Balancing Bureau (TABB) – International Standards for Environmental Systems Balance
 - ii. SMACNA – HVAC Testing, Adjusting and Balancing International Standards; with particular focus on the following chapter:
 - 1. Hydronic TAB procedures
 - iii. NEBB – Procedural standards for TAB of environmental systems.
 - iv. AABC – National standards for total systems balance.
- b. Hydronic balancing shall include the following minimum data:

- i. Prepare itemized equipment schedules, listing all heating and/or cooling elements and equipment in the systems to be balanced. List, in order on equipment schedules, by pump or zone according to the design, all heating and/or cooling elements, all zone balancing valves, and circuit pumps, ending with the last items of equipment or transfer element in the respective zone or circuit. Include on schedule sheet column titles listing the location, type of element or apparatus, design conditions and measured conditions. Prepare individual pump report sheets for each zone or circuit.
- ii. Use calibrated Venturi tubes, orifices, metered fittings, pressure gages and direct reading instrumentation to determine flow rates for system balance. Where flow-metering devices are not installed, flow balance in temperature difference across various heat transfer elements in the system is acceptable.
- iii. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- iv. Adjust hydronic distribution systems by means of balancing cocks, valves and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- v. Test pumps and adjust flow. Record the following on pump report sheets:
 1. Suction and discharge pressure;
 2. Running amps and brake horsepower of pump motor under full flow and no flow conditions;
 3. Pressure drop across pump in feet of water and total GMP pump is handling under full flow conditions.
- vi. Where available pump capacity is less than total flow requirements or individual system parts, proportional balancing must be performed.

5. ADJUSTING

- a. Recorded data shall represent actual measured or observed conditions.
- b. Permanently mark setting of valves, dampers and other adjustment devices allowing for settings to be restored. Set and lock memory stops.
- c. Leave systems in proper working, replacing belt guards, closing access doors, closing doors to electrical switch boxes and restoring thermostats to specified settings.
- d. Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require

special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.

END OF SECTION 230593

SECTION 230700 – INSULATION

A. GENERAL

1. This section includes insulation for piping, ductwork, and equipment, as shown on the plans.
2. All insulation, linings, coverings, and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50.
3. Insulation shall be Knauf, Certainteed, Owens Corning, or Johns-Manville.

B. PRODUCT

1. Duct

- a) Unless otherwise noted in the drawings all rectangular and round air conditioning supply, return, exhaust, and outside air duct shall be externally insulated with 2" thick, 3/4 lb. density foil scrim Kraft jacketed insulation. Joints shall be wrapped with a minimum of 3" wide FSK band of insulation to prevent any possible leakage and condensation. Ducts with widths over 30" shall be further secured on the underside with mechanical fasteners on 18" maximum centers.
- b) In addition to the duct wrap specified in B1.a of this specification, all low pressure rectangular supply and return ductwork shall be lined for 15 feet downstream from air handling unit (or up to and including the first 90 degree elbow). Duct liner shall be 1" thick, 2lb. dense, Shuller Permorate Linacoustic HP, or approved equivalent. Coat all exposed leading edges and transverse joints with a fire retardant adhesive.
- c) Duct sizes shown are actual duct dimension. Where ductwork is lined, as noted above, the duct insulation thickness shall be added to the listed ductwork dimensions for final duct size.
- d) Duct routed outside the building shall be insulated with minimum R-8 fiberglass. All joints shall be sealed with mastic prior to insulating. Apply final skin of sheet metal and seal weather tight.
- e) Duct board shall be 2" thickness rigid Fiberglas Owens/Corning or equal, ASTM C 612, 3 pounds per cubic foot density, with Foil reinforced jacket. The board shall be attached with field applied perforated base pins or weld pins applied on 12" centers. Finish shall be 8oz canvas jacket, totally sized with Foster 81-42W or equal lagging adhesive. Corner board shall be used on all edges.

2. Piping

- a) All condensate drain piping, make-up water piping, all refrigerant suction piping, and all refrigerant piping exposed on the exterior of the building shall be insulated with 1.5" wall tubular closed cell elastomeric insulation with all joints butted and cemented tight. Insulation shall be protected with aluminum jacket on all insulation exposed on exterior.

C. EXECUTION

1. Insulation shall be installed in accordance with manufacturer's recommendations.
2. All exterior piping insulation above grade shall be provided with a protective aluminum jacket with a factory-applied asphalt and kraft paper moisture barrier. Aluminum jackets shall be cross-crimped (longitudinally corrugated) for strength. Aluminum jackets shall be not less than 0.106" thick and shall be secured with aluminum or stainless steel screw; not more that 8" apart.
3. Any pipe covered prior to leak testing shall be exposed at contractor expense.
4. See 230553 for all labeling and marking.
5. Exposed piping, hangers, saddles and supports in occuppied areas shall be provided with primer coat for long term adhesion and shall be painted with minimum of 2 finish coats.

END OF SECTION 230700

SECTION 232000 - PIPE AND PIPE FITTINGS

A. GENERAL

1. This section includes all pipe, pipe fittings, hangers, and supports, etc. as may be required to provide a complete piping system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved. Covered pipe shall be exposed at contracts expense. Engineer shall be given 48 hours written notification of test.
3. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.
4. All piping shall be provided with end caps or have ends covered prior to installation.

B. PRODUCT

1. Refrigerant Piping
 - a) Refrigerant piping shall be Type "L" hard drawn copper.
 - b) Refrigerant piping fittings shall be sweat type wrought copper.
 - c) Use silver solder on all refrigerant piping.
 - d) Copper tubing, which is out of round, will not be acceptable.
 - e) Not notching or mitering of copper tubing will be permitted.
 - f) Do not allow piping to rub against masonry when expanding and contracting.
 - g) Close and protect open ends of piping until final connections are made. Such closing shall be made with fittings, which cannot be easily removed. Caps or plugs shall be made with fittings, which cannot be easily removed. Caps or plugs shall be required at all times during construction so that no pipes are left open at the end of any day's work, even though continuation is expected the next day.
 - h) Copper pipe ends shall be reamed, sanded and deburred before soldering. Non-corrosive flux shall be used.
 - i) Test refrigerant piping in accordance with the NC Building Code.
2. Gas Pipe
 - a) Piping below grade shall be polyethylene having a cell classification of ASTM D-3350-PE234343E. Pipe and pipefittings shall meet the requirements of ASTM D-2513. All fittings and access shall be as manufactured and furnished by the pipe supplier.
 - b) Piping above grade shall be standard weight, schedule 40, black steel pipe conforming to ANSI B36.10, ASTM A53, or ASTM 106. Screwed fitting

shall be malleable iron, 150 lb. S.W.P, will banded pattern conforming to ANSI B16.3.

- c) Connections between plastic and metallic piping shall be in accordance with the State Code.
- d) All pipes shall be buried in accordance with manufacturer's recommendations.
- e) All plastic pipe shall have a 3" wide detector tape installed 18" above finished grade.
- f) All metal pipe run below grade shall be coated with coal tar enamel coating.
- g) All exposed gas piping surfaces, supports, etc., shall be painted one prime and one finish coat of rust resistant paint. Finish coat shall be yellow according to OSHA Standards unless otherwise noted on the plans.
- h) All gas piping systems shall be tested in strict accordance with the National Fire Protection Association's National Fuel Gas Code NFPA54, and the State Building Code.
- i) All gas piping system shall be air tested at 50 psi for a period of not less than one (1) hour without loss of pressure. Any leaks that occur shall be repaired and another test started. All joints shall be checked for leaks with a water-soap solution. Where leaks are found, the joint shall be re-made.

3. Condensate Drain Pipe

- a) Drain pan condensate piping shall be Type "L" copper with all joints soldered with 95-5 solder.
- b) Terminate condensate drain lines as shown on drawings. Condensate drains from rooftop units are to be routed to nearest roof drain.
- c) Provide unions on both sides of trap.

C. EXECUTION

- 1. Piping 2" and smaller shall be welded or have screwed fittings with extra heavy nipples, unless otherwise noted.
- 2. Piping 2 1/2" and larger shall have welded fittings of the same material and weight as the piping in which they are installed.
- 3. Welding tees or weldolets shall be used.
- 4. No "Stub-In" shall be permitted.
- 5. All insulated piping shall be protected by saddles at horizontal support points or by insulation protectors if the insulation has a vapor barrier. Saddles where used shall be welded to the pipe.
- 6. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be Schedule 40, black steel, 1/2" in diameter larger than the pipe and insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeve

through floors shall extend two inches above finished floor. Sleeves in exterior walls shall be caulked and made watertight.

7. All pipe welding shall be uniform and thorough, and shall comply with AWS standards for pipe weldings. All pipe welding must be done by AWS certified welders experienced in this type of work. Provide copy of certification with other credentials to Engineer with piping submittal package.

END OF SECTION 232000

SECTION 233000 - DUCTWORK

A. GENERAL

1. This Section includes ductwork, splitter dampers, balancing dampers, air deflection devices, etc. required for a complete system.
2. The Drawings are intended to indicate, with reasonable accuracy, the location of components and the general arrangement of the system. All offsets, bends fittings and other devices, not shown but required for the full operation of the system, shall be provided.
3. Refer to specification Section 230700 for duct insulation.

B. PRODUCT

1. Low and Medium Pressure Ductwork.
 - a. Round and rectangular ductwork shall be of gauges and construction methods as indicated in the latest ASHRAE Guide and SMACNA Standard.
 - b. Splitter dampers, balancing dampers, turning vanes and air deflection devices shall be installed as shown on the plans and/or where required for the proper control of airflow.
 - c. All take-offs to diffusers shall be tapered type taps with factory damper and locking quadrant.
 - d. All take-offs to VAV Units shall be made with conical taps. Flag all dampers above ceiling with yellow paint.
2. Flexible Ductwork
 - a. Ducts shall be insulated type with foil wrapper complying with NFPA Standard No. 90A and UL181.
 - b. All flexible ducts shall have a factory installed 1" thick 1.5 lb./cu. ft. fiberglass insulation with a seamless vinyl vapor barrier.
 - c. Length of flexible duct shall not exceed 6 feet.
 - d. Flexible duct shall be secured and sealed in place with mastic to hard duct collars at each end, with nylon tie-wraps on the wire enforced inner mylar skin, followed by the insulation layer and then the exterior vapor layer secured with another tie-wrap.
3. Conditioned Air Exposed Ductwork Oval/Round Ductwork

- a. Exposed shall be round, 18 gauge spiral lock seam with paintable finish, double wall and internally insulated at the factory. Inner wall shall be perforated.
- b. Duct shall be fastened using sheet metal screws only and no duct tape.

C. EXECUTION

- 1. Turning vanes shall be installed in square elbows for all ductwork.
- 2. Duct transitions, splitter dampers, and balancing dampers shall be constructed of gauges and materials as indicated in ASHRAE Guide and SMACNA Standards.
- 3. Hangers and supports for ductwork shall be of metal bands, angles and rods as indicated in ASHRAE Guide and SMACNA Standards. The minimum bandwidth shall be 1", 16 gauge, galvanized steel.
- 4. Where ductwork passes through floors and walls, the space around the ducts shall be sealed in an approved manner with mineral wool insulation, and/or proper fire seal material approved by the State or Local Inspector.
- 5. In exposed areas and mechanical rooms, ductwork openings shall be finished with a metal collar.
- 6. Ductwork shall be cross-braced and reinforced properly with galvanized steel angles as recommended by SMACNA Standards.
- 7. Where ductwork behind grilles or diffusers is visible, it shall be painted with two coats of flat black base fire retardant paint.
- 8. Duct connections to outside air louvers shall be pitched to drain outside and shall be soldered watertight.
- 9. Tape all low-pressure joints with Hardcast or approved equal for completely airtight system.
- 10. All medium pressure joints are to be sealed in accordance with SMACNA standards for ductwork 2" W.C. and greater. All ducts shall be air tight, rigid and free from vibration and noise.
- 11. Duct dimensions shown on the drawings are net inside dimensions.
- 12. Where ductwork is lined, as noted in Section 230700, the duct insulation thickness shall be added to the listed ductwork dimensions for final duct size.

END OF SECTION 230000

SECTION 233400 – FANS

A. GENERAL

1. Provide all fans, roof caps, etc., of the type and capacities indicated on the Drawings.
2. Fans, roof caps, curbs, etc., shall be by the same manufacturer.
3. Fans shall be by Greenheck, Loren Cook, Carnes, Penn, American Air Cool, or equal.

B. PRODUCT

1. All fans, roof caps, etc., shall be as scheduled on the Drawings.
2. All fans shall be equipped with 1/2" mesh birdscreen, gravity damper.
3. All fan motors shall have vibration isolators, motor housing shall be grounded, and motor overload protection shall be provided.
4. All curbs shall be of the pre-fab insulated type.
5. Provide NEMA 3R rated disconnect switch.

C. EXECUTION

1. Fans and roof caps shall be installed as shown on the plans.
2. Roof openings and locations are to be coordinated with the other trades.
3. Fan motors and all other electric components shall bear the UL or other acceptable third party testing agency label.

END OF SECTION 233400

SECTION 233700 – AIR DISTRIBUTION

A. GENERAL

1. Furnish and install air distribution devices of the type, size and configuration indicated on the drawings.
2. Refer to Architectural Reflected Ceiling Plan and Schedule for types of ceiling specified, and provide compatible frames on air distributions devices

B. PRODUCT

1. Diffusers, Grilles, and Register
 - a. Surface mounted devices shall have sponge gaskets.
 - b. Devices shall be of steel construction with baked on enamel finish, unless otherwise noted.
 - c. All devices shall be by Kureger, Carnes, Titus, Metalaire, Tuttle & Bailey, Price or approved equivalent.
 - d. Ceiling mounted diffusers shall have insulation applied to metal top and neck to prevent sweating. Insulation shall match duct insulation.
 - e. Soffit grilles shall be extruded anodized aluminum with ¼" x ¼" insect screen.
 - f. Return and exhaust grilles in lay-in ceilings shall have full louvered face (24" x 24").
 - g. Devices in moist and humid spaces shall be of aluminum construction.
 - h. Provide heavy-duty steel return grilles (in gymnasiums, multi-purpose rooms, etc) or in all locations where the grille is within 8' off the floor.
2. Louvers
 - a. Louvers shall be 12 gauge extruded aluminum with drainable blades, unless otherwise noted.
 - b. Louvers shall be provided with ½ " x ½ " insect screen.
 - c. Louvers shall be Arrow, Ruskin, Air Balance or approved equivalent.
 - d. Provide louvers with required mounting sleeves/support. Coordinate opening with general contractor.
 - e. Louver indicated on drawings to have motorized damper shall be interconnected with fans indicated, and shall open when the fan is energized. This Contractor shall provide and make all interconnecting control wiring from the fan to the damper

C. EXECUTION

1. Air distribution devices shall be mounted level, straight, and flush with walls or ceilings.
2. Color shall be as indicated on drawings, or as selected by the Architect/Engineer.
3. Locations of all air distribution devices shall be coordinated with ceiling and lighting work.
4. Provide submittals data to include, cfm, pressure drop, dimensional, velocity and noise criteria data.

END OF SECTION 233700

SECTION 235533 – GAS FIRED UNIT HEATER

A. GENERAL

1. Contractor shall furnish and install Modine Separated Combustion high efficiency gas-fired unit heater(s).
2. Performance shall be as indicated on the equipment schedule in the plans.
3. Units heaters shall have C.S.A. (Canadian Standards Association) design certification.
4. The unit capacity shall be as listed on the plans. The output capacity shall be a minimum of 81% or 82% of the input based on steady-state thermal efficiency as certified by the Canadian Standards Association (C.S.A.).
5. Units shall be manufactured by Modine, Reznor, Detroit, or approved equivalent.

B. PRODUCT

1. Casing shall be 22 gauge cold rolled steel draw-formed with aesthetically designed rounded corners, and fitted to eliminate exposed fasteners. Entire casing shall be powder painted with an attractive, tough, corrosion resistant baked-on polyester gray-green paint. Casing shall also include a hinged bottom panel for easy access to the burner compartment. Horizontal air deflector louvers shall be provided to aid in controlling the discharge air pattern.
2. Burner material shall be 409 stainless steel, with non-clogging, slotted ports with 409 stainless steel separator strip designed for good lighting characteristics without noise of extinction.
3. Heat exchanger shall be designed with direct-fired primary heat exchanger tubes constructed of stainless steel. The unit shall also have secondary heat exchanger tubes designed to extract heat from the combustion gases after the gases have passed through the primary heat exchanger tubes. The secondary heat exchanger tubes shall be made of Type 409 Stainless Steel. The header plates of the heat exchanger shall be constructed of Type 409 Stainless Steel and the entire heat exchanger assembly shall be completely heliarc machine-welded and shall have contoured stress-free, air-foil designed tubes.
4. The units shall have a factory mounted and wired integral power exhaustor directly connected to the unit collector box assembly. The unit shall also include a factory mounted and wired safety pressure switch designed to prevent pilot and main burner ignition until positive venting has been proved. Units shall be designed for single vent connection and shall include factory supplied concentric vent kit.
5. The units shall be provided with a combustion air inlet collar for connection of combustion air pipe directly to the outside atmosphere. Unit shall include factory supplied combustion air inlet terminal.

6. Units shall be provided with intermittent-duty pilot ignition and shall be with 100% shut-off and continuous retry. All units shall include a redundant type main gas valve, pilot valve, low voltage control transformer, safety high limit control (overheat control), safety pressure switch, gas valve regulator, manual shut-off valve and terminal board for low voltage wiring. All gas controls shall be rated for a maximum inlet pressure of ½ psi.
7. Each unit heater shall have a single motor and propeller totally enclosed with thermal overload protection. Propeller shall be statically balanced and shall be equipped with a 360° safety fan guard.
8. Each unit shall have a single motor and centrifugal blower completely factory assembled and mounted. Motor shall be totally enclosed. Single phase motors shall be equipped with thermal overload protection. Blowers shall be statically and dynamically balanced for quiet operation.

C. EXECUTION

1. Unit(s) shall be installed as shown on the drawings.
2. Unit(s) shall be provided with accessories noted on the drawings.

END OF SECTION 235533

SECTION 237300 - AIR HANDLING UNIT

PART 1 - GENERAL

- 1.1 Furnish and install air handling unit(s) as shown on plans with capacities indicated on plans.
- 1.2 Quality Assurance
 - A. Constant Volume Air Handling Units: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430.
 - B. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410-87.
- 1.3 Submittals
 - A. Submit unit performance including: capacity, nominal and operating performance.
 - B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
 - C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations. Indicate unit shipping, installation and operating weights including dimensions.
 - D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- 1.4 Extra Stock
 - A. Provide one initial plus one spare set of all filters.
 - B. Provide spare set of drive belts.

PART 2 - PRODUCT

- 2.1 General
 - A. Factory fabricate air handling units of sizes, capacities, and configurations as scheduled on drawings and exactly as specified herein.
 - B. Units shall be by Trane, Carrier, or Daikin.
- 2.2 Casing
 - A. Unit shall be constructed of a complete structural frame with removable panels. Removal of side panels shall not affect the structural integrity of the unit.
 - B. Construct casing sections located upstream of supply fan for operation at 4 inches water gage negative static pressure and casing sections located downstream of supply fan for operation at 6 inches water gage positive static pressure.

- C. All exterior and interior panels shall be constructed of G90-U galvanized steel.
- D. Seal and gasket all joints between exterior panels and structural frames with closed-cell foam gasketing for air seal and acoustical break.
- E. Casing shall have full size removable access doors as scheduled on drawings. Access doors shall have double wall construction. Provide automotive style neoprene gasketing around full perimeter of access doors to prevent air leakage. Provide "ventlock" style non-corrosive alloy latches operable from the inside or outside of unit.
- F. Insulate casing sections with 2" thick 1-1/2 pound per cubic foot density fiber glass insulation. Provide double wall casing construction and encase insulation between solid exterior and solid interior casing panels such that no insulation is exposed to airstream. Foil facing on insulation is not acceptable as alternate to double wall construction. Insulation shall comply with NFPA 90A

2.3 Drain Pan Construction

- A. Provide insulated drain pans constructed of G90-U galvanized steel exterior panels and stainless steel interior liner. Encase insulation between exterior and interior walls. Insulation is closed cell foam injected with a R-value of 8. Stainless steel drain connection is required. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage. Units with cooling coils shall have drain pans under complete cooling coil section. All drain pan connections will be to the side of the unit to enable proper trapping.

2.4 Fans

- A. Provide supply fan section(s) with double width, double inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Key fan wheels to fan shaft to prevent slipping.
 - 1. Provide self-aligning, grease lubricated pillow-block ball bearings selected for L-50 200,000 hour average life per ANSI/AFBMA 9. Extend both grease lubrication fittings to drive side of unit with plastic tubes and zerk fittings rigidly attached to drive side bearing support.
- B. Mount fans on isolation bases. Internally mount motors on same isolation bases and internally isolate fans and motors with 2 inch spring isolators. Install flexible canvas ducts between fan and casings to ensure complete isolation. Flexible canvas ducts shall comply with NFPA 90A. If no isolators or flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply ductwork and piping by contractor in order to avoid transmission of noise and vibration through the ductwork.
- C. Fan sections shall have full height, double wall, hinged, removable access doors on drive side for inspection and maintenance of internal components.
- D. Fans shall have shaft grounding rings.

2.5 Motors and Drives

- A. Factory install all motors on slide base to permit adjustment of belt tension.
- B. Fan Motors shall be inverter duty, premium energy efficiency open drip-proof.
- C. V-Belt Drive shall be variable pitch rated at 1.5 times the motor nameplate.
- D. Manufacturer shall provide for each fan a nameplate with the listed information to assist air balance contractor in start up:
 - 1. Fan and motor Sheave part number
 - 2. Fan and motor bushing part number
 - 3. # of belts and part numbers
 - 4. Design RPM and Motor HP
 - 5. Belt tension and deflection
 - 6. Center distance between shafts
- E. Motor shall be tested in accordance with NEMA MG-1 Standard for General Purpose Industrial AC Small and Medium Squirrel-Cage Induction Motors.
- F. Motors shall satisfy the most current energy efficiency requirements issued by the US Department of Energy in their reference document Energy Conservation Standards for Commercial and Industrial Electric Motors, otherwise known as 10 CFR Part 431 Integral HP Motor Final Rule.

2.6 Coils

- A. Coils shall be manufactured by the same company as the supplier of the air handling unit. Install coils such that headers and return bends are enclosed by unit casings.
- B. Construct coils of configuration plate fins and seamless tubes. Fins shall have collars drawn, belled and firmly bonded to tubes by means of mechanical expansion of tubes. Do not use soldering or tinning in bonding process.
- C. Construct coil casings of stainless steel with formed end supports and top and bottom channels. If two or more coils are stacked in unit, install intermediate drain channels between coils to drain condensate to main drain pans without flooding lower coils or passing condensate through airstream.
- D. Coils
 - 1. Clearly label supply and return headers on outside of units such that direction of coil water-flow is counter to direction of unit air-flow.
 - 2. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water.

3. Construct headers of round copper pipe.
4. Construct tubes of 1/2 inch O.D. minimum .016 inch thick minimum copper and construct fins of aluminum.
5. Capacity shall be as indicated on plans.

2.7 Filters

- A. Provide factory fabricated filter segment of the same construction and finish as unit casings. Filter sections shall have filter guides and full height, double wall, hinged, removable access doors for filter removal. Construct doors in accordance with Article 2 Paragraph E. Provide filter blockoffs as required to prevent air bypass around filters.
- B. Provide MERV 13 disposable filters.

2.8 Dampers

- A. Provide low leak outside air dampers as scheduled on drawings. Dampers shall be Ruskin CD60 double skin airfoil design or equivalent. Provide opposed blade action with metal compressible jamb seals and extruded vinyl blade edge seals. Blades shall rotate on stainless steel sleeve bearings. Damper blade lengths shall not exceed 60 inches. Leakage rate shall not exceed 5 CFM/square foot at one inch water gage and 9 CFM/square foot at 4 inches water gage. All Leakage testing and pressure ratings will be based on AMCA Publication 500.

2.9 Access Sections

- A. Access for inspection and cleaning of the unit drain pan, coils and fans segments shall be provided. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be included in the maintenance manual. Access section shall have double wall, hinged, removable access doors on one sides of sections. Construct doors per Article 2 Paragraph E.

PART 3 - EXECUTION

- 3.1 Install unit(s) as detailed on plans.
- 3.2 Controls shall be as indicated on plans.
- 3.3 Unit shall be set on 6" concrete curb. Paint curb safety yellow and shall extend 6" beyond the footprint of the equipment.

END OF SECTION 237300

SECTION 15722 - AIR COOLED CONDENSING UNIT

PART 1 - GENERAL

- 1.1 Furnish and install an air-cooled condensing unit(s) of the capacity shown on the drawing.
- 1.2 Unit(s) shall be completely factory assembled and pretested.
- 1.3 Unit(s) shall be Trane, Carrier, Daikin, or approved equivalent.

PART 2 - PRODUCT

- 2.1 Unit casing shall be galvanized steel, zinc phosphatized, baked enamel finish and fully weatherproof.
- 2.2 Condenser coil shall be of non-ferrous construction, aluminum plate fins, mechanically bonded to seamless copper tube, sub-cooling circuitry.
- 2.3 Condenser fans and motors shall be direct drive, propeller type fins, Class B motor insulation, inherent protection, permanently lubricated, resiliently mounted; fans shall have safety guard.
- 2.4 Controls shall be factory wired and include high and low pressure stats, compressor overload devices, short cycling timer (5 min.), discharge line thermostats, oil pressure switches, pressure relief valve and circuit breakers.
- 2.5 A wire guard shall be provided over the condenser coils for protection from physical damage. The wire guard shall be either factory mounted or field erected.
- 2.6 The refrigerant for the condensing unit shall be R-22, or other refrigerant not containing CFC's.

PART 3 - EXECUTION

- 3.1 Unit shall be mounted on concrete pad as shown on the plans.
- 3.2 Controls shall be as indicated on the plans, or as specified herein.
- 3.3 Provide 5-year compressor warranty.

END OF SECTION 15722

SECTION 238143 – SPLIT SYSTEM HEAT PUMP

A. GENERAL

1. Furnish and install a direct expansion heat pump indoor unit with capacity as indicated on the plans.
2. Unit shall be completely factory assembled and pretested.
3. Unit shall be Trane, Carrier, Daikin or approved equivalent.

B. PRODUCT

1. Air Handling Unit/Fan Coil
 - a. Casing shall be Galvanneal steel, bonderized with baked enamel finish.
 - b. Fan section shall have forward curved blades, centrifugal type, belt or direct drive. Fan shall be statically and dynamically balanced and shall run on permanently lubricated bearings.
 - c. Cooling coils shall be of non-ferrous construction with mechanically bonded aluminum plate fins on copper tube.
 - d. Casing shall be insulated with fire retardant insulation in accordance with NFPA 90A. Insulation shall be secured to casing panels with waterproof cement and permanent fasteners.
 - e. A condensate drain pan shall be furnished with threaded pipe connections and shall extend completely under the coil section. Condensate drain lines shall be insulated copper.
 - f. Electric heater assembly shall include circuit breakers, automatic re-setting limit switches and heat limiter for primary and secondary over-current and thermal protection.
 - g. Accessories shall be as indicated on the drawings.
2. Outdoor Unit
 - a. Cabinet shall be single, enclosed, and weatherproof casing or galvanized steel bonderized and finished with baked enamel. A base pan drain connection shall be provided. Panels shall be easily removable for service access.
 - b. Compressor system shall consist of serviceable hermetic compressor. Compressor shall have service shut-off valves; suction pressure operated capacity control unloader, suitable vibration isolators and crankcase heater.
 - c. Condenser and evaporator coils shall have aluminum plate fins mechanically bonded to copper tubes.

- d. Outdoor fans shall be propeller type, direct driven. All motors shall have overload protection and suitable vibration isolators. Cooling system shall be protected by fusible plug, high and low pressure stat, compressor motor overloads, anti-cycling timer device (5 minutes). Controls shall include low voltage control circuit transformer, compressor and fan motor safety controls with automatic reset, high and low pressure cutout switches and terminals for accessory electrical connections.

C. EXECUTION

1. Unit shall be installed as shown on the plans, in strict accordance with manufacturer's recommendations.
2. Controls shall be as indicated on the plans.
3. Provide 5-year compressor warranty.
4. Provide with spare belts for any belt driven fans.
5. Provide with (2) sets of filters. Contractor to install one set at system start-up and a second set at completion of project.

END OF SECTION 238143

SECTION 238239 – ELECTRIC UNIT HEATER

A. GENERAL

1. Heating units shall be installed where indicated on the drawings.
2. All heating units shall be by the same manufacturer.
3. Heating units shall be Reznor, Q-Mark, Markel, or approved equivalent.

B. PRODUCT

1. Heating units shall be shall UL listed.
2. Heating units shall be provided with baked-on enamel finish.
3. Heating element to be heavy-duty steel finish brazed to steel sheathed turbulence elements.

C. EXECUTION

1. Unit(s) shall be installed as shown on the drawings.
2. Unit(s) shall be provided with accessories noted on the drawings.

END OF SECTION 238239

SECTION 260000 - GENERAL PROVISIONS (ELECTRICAL) CONTRACT

PART 1 - GENERAL

1.1 Scope of Work

- A. This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

1.2 Quality Assurance

- A. See the General and Supplementary General Conditions.
- B. All work shall be in accordance with the North Carolina State Building Code, which includes the 2020 edition of the National Electrical Code.
- C. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- D. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- E. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Article 8 of the General Conditions will be followed for substitutions after award of Contract.

1.3 Submittals

- A. See General and Supplementary General Conditions and Division 1.
- B. Within ten (10) days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval.
- C. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.

- D. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.
- E. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data, and sufficient manufacturer's literature to operate and maintain all equipment.
- F. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.

1.4 Product Delivery, Storage and Handling

- A. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- B. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground.
- C. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

1.5 Work conditions and Coordination

- A. The Contractor shall review the mechanical plans to establish points of connection and the extent of electrical work to be provided in his Contract.
- B. This Contractor shall be responsible for all electrical work and make final connections to equipment installed in his Contract. Unless otherwise noted, this Contractor shall wire to disconnect switches, junction boxes, or circuit breakers as provided in his Contract.
- C. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be approved by Architect/Engineer and shall be at the Contractor's expense with no extra cost to the owner.

1.6 Guarantee

- A. See the General and Supplementary General Conditions.
- B. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Owner.

PART 2 - PRODUCT

- 2.1 Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
- 2.2 The Contractor shall provide nameplates for identification of all equipment, switches, panels, transformers, etc. See specification section 26 05 53 Electrical Identification.

- 2.3 All materials and equipment shall be approved third party agencies or bear re-examination listing where such approval has been established for the type of device in question. Third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment

PART 3 - EXECUTION

3.1 Inspection

- A. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect or Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent thereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.
- B. It is the responsibility of the electrical contractor to notify the State Electrical Inspector with the Department of Administration to schedule required inspections including rough-in, above ceiling and final inspections. Electrical Wiring Inspections are required in North Carolina General Statutes NCGS 143-143.2 by the appropriate official electrical inspector or inspection department. For State buildings, the State Construction Office (SCO) has that responsibility, as noted in NCGS 143-341(3)d. No project is exempt from electrical inspection(s), regardless of dollar value or funding source. All scheduling of electrical inspections with the SCO electrical inspector shall be Monday thru Friday unless specifically exempted and approved by SCO".

3.2 Installation

- A. All work shall be performed in a manner indicating proficiency in the trade.
- B. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- C. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- D. All patching shall be done in such a manner as to restore the areas or surfaces as to match existing finishes.
- E. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support his equipment.
- F. Grounding
1. All grounding shall be in accordance with the requirements of the NEC. The main service ground shall be bare copper wire in conduit clamped to building structural

steel. Bond ground wire to conduit at each end. At service equipment, do not bond system neutral bus to equipment grounding bus per NEC 250.32, connect ground bar to ground wire from existing building D. In addition, cad weld to 10'x 3/4" diameter copper clad steel driven ground rod and clamp to metal cold water main. See the Electrical Riser Diagram.

2. Install a separate green grounding conductor with the circuit conductors in each conduit. Use of the conduit only shall not be an acceptable means of equipment grounding.
3. Install ground wire in all flexible connections (flex shall not be acceptable for grounding purposes), and in all wiremold.
4. All grounding conductors shall be sized per Article 250.122 of the NEC.
5. The ground system shall be tested with a ground resistance and soil resistivity tester and the test report submitted to the Engineer. If resistance exceeds 25 ohms provide an additional driven ground rods separated by a minimum of 6' interconnected with #3/0 copper. A copy of the test report shall be submitted to the engineer to be included in the project closeout document.
6. All ground points shall be accessible for inspection.
7. Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250.122 and lugged to the box.
8. Electrical Identification. See section 26 05 53

3.3 Performance

1. The Contractor shall perform all excavation, backfilling, and patching operations as indicated on the drawings.

3.4 Erection

1. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

3.5 Field Quality Control

1. The Contractor shall conform to the requirements of Division 3 for concrete testing.
2. The Contractor shall test his entire installation and shall furnish the labor and materials required for these tests. Tests shall be performed in accordance with the requirements of the particular section of the specifications and in accordance with the requirements of the State Ordinances and Codes, and the National Electrical Code. The Contractor shall notify the Engineer of his readiness for such test. Final inspections by the N.C. Department of Insurance and N.C. Department of Administration (State Construction Office) are required, as State Inspectors' Certificates are required, prior to authorization of final payment.

3. Testing required for compliance with the Contract shall be stated in subsequent sections. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.
4. Documentation
 - a. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
 - b. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

3.6 Adjust and Clean

1. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
2. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.
3. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).

END OF SECTION 260000

SECTION 260520 - WIRES AND CABLES

PART 1 - GENERAL

- 1.1 All conductors shall be properly marked showing manufacturer's name, insulation type, voltage rating and wire size. All insulation is to be rated for minimum of 600 volts.
- 1.2 Wire sizes shall be as shown. No wire smaller than No. 12 AWG shall be used. The maximum conductor size shall be 500 KCMIL.
- 1.3 Where the conductor length from the panel to the first outlet on a 120 volt exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall be increased by at least one size. Provide associated drawing modifications as needed for compliance with NEC Art 250.122(B) proportional increase in equipment ground conductor wherever ungrounded conductor sizes are increased for voltage drop.
- 1.4 Conductors shall be manufactured by US Wire and Cable, Triangle, Okonite, Southwire, or approved equivalents.
- 1.5 Wiring for 120/208 volt systems and 277/480 volt systems shall not be mixed in the same race way, pull or junction box.

PART 2 - PRODUCT

- 2.1 All conductors shall be copper and shall conform to Underwriters' Standards. Wires No. 10 and smaller shall be solid. Wires 8 and larger shall be stranded.
- 2.2 All wire shall be labeled two (2) feet on centers giving size, type voltage, rating, and manufacturer's name. Wire #6 and smaller #6 shall be factory color coded. Wire larger than #6 may be color coded with Okonite 2000 volt colored tape at all terminals of the run, and at all junctions.
- 2.3 Where applicable, all wire shall be color coded as follows, or approved by the Engineer:

A. 120/208-volt system:

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

B. 277/480-volt system:

Phase A	Brown
Phase B	Orange
Phase C	Yellow
Neutral	Natural Gray
Ground	Green

- 2.4 Insulation type shall be UL labeled for the appropriate type of use and temperature. Insulation types are as follows:

- A. The insulation type for interior wiring shall be dual-rated THHN/THWN or XHHW.
- B. The insulation type for wiring in exterior wet locations shall be THWN-2 or XHHW-2.

PART 3 - EXECUTION

- 3.1 Conductors shall be run in conduit and shall be continuous from outlet to outlet. Splices will not be made except within accessible outlet or junction boxes, troughs, or gutters.
- 3.2 Solid conductors shall be spliced by using Ideal "wing- nuts", 3M Company's "Scotchlok" connectors for branch circuit splices. Crimp connectors will not be allowed for branch circuit splicing.
- 3.3 Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with U/L-approved insulating covers, may be used instead of mechanical connectors plus tape.
- 3.4 On mechanical splices, taps or joints taping shall be with at least two (2) layers of approved gum rubber tape which will be laid on the half-lap followed by at least one (1) layer of friction or plastic tape laid on with half-lap. It is intended that all taping shall be a permanently secured insulation equal to that of the wire.
- 3.5 All conductors in any conduit shall be at one specific voltage. Conductors of different voltages shall be run in separate conduits.
- 3.6 Neutral conductors shall be properly installed as to prevent grounding of the neutrals in any conduit. Multi-wire circuits with shared neutral conductors are not allowed. Each single pole load shall have individual neutral for each circuit.
- 3.7 Neatly train and lace wiring inside boxes, equipment, and panelboards.
- 3.8 Make conductor lengths for parallel circuits equal.
- 3.9 Pull all conductors into a raceway at the same time. Use third party approved wire pulling lubricant for pulling #4 AWG and larger wires.
- 3.10 Insulation Resistance Testing.
All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt insulation resistance testing. The procedures listed below shall be followed:
 - 1. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conductors and between conductor and the grounding conductor.
 - 2. After all fixtures, devices and equipment are installed and all connections completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a insulation resistance testing reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The contractor

shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

3. The contractor shall send a letter to the engineer certifying that the above has been done and tabulating the insulation resistance testing readings for each panel. This shall be done at least four (4) days prior to the final inspection.
 4. At the final inspection, the contractor shall furnish a insulation resistance testing and demonstrate to the engineer and State Construction Office representative (applicable for state projects) that the panels comply with the above requirements. The contractor shall also furnish a hook-on type ammeter and a voltmeter to take current and voltage readings as directed by the engineer and Construction office representative.
- 3.11 Use of split bolt connectors is not acceptable.
- 3.12 Prior to energizing, feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests shall be included with the project record document.
- 3.13 Voltage Drop:
1. Conductors for branch circuits shall be sized to prevent a voltage drop exceeding three percent (3%) at the farthest outlet of power, heating and lighting loads, or any combination of such loads. The maximum total voltage drops on both feeders and branch circuits to the farthest outlet shall not exceed five percent (5%).
 2. Where the conductor length from the panel to the first outlet on a 277-volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Conductor size of remaining branch circuit shall increase as needed to meet above voltage drop limitations.
 3. Where the conductor length from the panel to the first outlet on a 120-volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Conductor size of remaining branch circuit shall increase as needed to comply with above voltage drop limitations.
 4. Provide associated drawing modifications as needed for compliance with NEC Art 250.122(B) proportional increase in equipment ground conductor wherever ungrounded conductor sizes are increased for voltage drop.

END OF SECTION 260520

SECTION 260533 - BOXES AND CABINETS

PART 1 - GENERAL

- 1.1 The Electrical Contractor shall provide junction boxes, pull boxes, cable, support boxes, and wiring troughs as required by NEC and as otherwise indicated in the Drawings.
- 1.2 All necessary mounting hardware and accessories shall be provided for a complete installation.

PART 2 - PRODUCT

- 2.1 Outlet and junction boxes shall be 4" minimum size, octagonal in ceilings, 4" square or rectangular (4" x 4" minimum for walls) except as noted below. Ceiling outlet boxes shall not be less than 1 1/2" deep, but in no case shall the size and depth of boxes be less than the required by the NEC.
- 2.2 Outlet boxes shall be equipped with plaster rings of appropriate depth to finish flush with finished walls. Outlets in exposed masonry wall shall be equipped with extra deep square corner tile rings so that box may be installed in the core of the block.
- 2.3 Outlets for concealed work and ceiling outlets for exposed work shall be galvanized stamped steel. Boxes shall be as manufactured by Steel City Electric Company, Metropolitan, B & C or equivalent.
- 2.4 Wall outlets for exposed conduit work shall be Crouse- Hinds, Appleton, Walker, or equal, series FS and FD switch and receptacle threaded hub boxes, with matching FS and FD covers.
- 2.5 Junction boxes for change of direction or feeder taps shall be furnished where required, shall be of adequate size to prevent crowding conductors in accordance with the requirements of the electrical code and job requirements and shall be accessible.
- 2.6 Junction boxes on finished wall and ceilings shall be flush with covers.
- 2.7 Junction boxes larger than 5" square shall be galvanized and without pre-formed knockouts.

PART 3 - EXECUTION

- 3.1 Boxes and troughs shall be supported independently of conduit entering them. Brackets, threaded rod hangers with lock nuts, bolts, or other suitable supporting methods may be used.
- 3.2 Thru-the-wall outlet boxes shall not be permitted. Outlet boxes shown back to back on plans, shall be separate boxes connected where required using a loop of flexible metallic conduit with ground wire. Boxes shall be separated a minimum of 18 inches apart.
- 3.3 In general, outlets shall be installed at the heights indicated on the fixture and symbol legend.
- 3.4 Each outlet designated on the plans shall be provided with an outlet box.
- 3.5 Each outlet box which supports a fixture shall be provided with a fixture stud into the outlet box. Outlet box and/or fixture stud shall be attached with not less than three screws or bolts.
- 3.6 Exterior outlets shall be provided with watertight gaskets and covers.

END OF SECTION 260533

SECTION 260545 - CONDUIT AND CONDUIT FITTINGS

PART 1 - GENERAL

- 1.1 Conduit shall be delivered to the project site in bundles of full length pipes, each length marked with the trademark of the manufacturer and the Underwriters' Laboratories, Inc. stamp. Each conduit length shall be straight, true and free from scales, blisters, burrs and other imperfections.
- 1.2 Within the building parameters and above the floor slab, the rigid steel conduit specified shall be used unless specifically noted otherwise.
- 1.3 Conduit size for control wiring shall be a minimum of one-half (1/2) inch conduit. All branch circuit conduit shall be a minimum of one-half (1/2) inch. Percent filled and derating shall be in accordance with the National Electrical Code. Flexible metal and water-tite ("sealtite") conduit in size 1/2" and larger shall be acceptable for motor, appliance, and fixture connections from fixture junction boxes or appliance/motor disconnects provided a ground wire is installed in the flex and the flex assembly is an integral part of the fixture, shipped from the same factory as the fixture, and 3rd party agency approved for such use. The third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment. This same requirement shall apply for motor/appliance connections.
- 1.4 All conduit shall be installed in accordance with the National Electrical Code.
- 1.5 Conduit shall be manufactured by Triangle, G.E., Cruse-Hinds, or equivalents.
- 1.6 Conduit fittings shall be manufactured by Rayco, T & B, Crouse Hinds, or equivalents.
- 1.7 Surface mounted raceway shall be used as noted on the plans in lieu of exposed conduit. Surface mounted raceway shall be manufactured by Wiremold or approved equivalents. A separate ground wire shall be run in the surface mounted raceway.

PART 2 - PRODUCT

- 2.1 Thin Wall Conduit and Fittings
 - A. Electrical metallic tubing (EMT) shall be cold-rolled steel tubing with zinc coating on the outside and protected on the inside by a zinc, enamel or equivalent corrosion-resistant coating conforming to the latest requirements of ANSI. Conduit shall meet the Rigid Conduit Association Standards.
 - B. Electrical metallic tubing fittings shall be all steel plated hexagonal threaded compression type. No pot metal, indenter, or set screw fittings, shall be used. EMT connectors shall have insulated throats.
- 2.2 Rigid Steel Conduit and Fittings
 - A. Rigid steel conduit, including elbows and nipples, shall be standard weight, mild steel pipe, hot dipped galvanized, sherardized or zinc-coated conforming to the requirements of ANSI C80.1, 1966 or later edition. Rigid steel conduit shall also meet the latest requirements of Underwriters' Laboratories, Inc. Standards for Rigid Metallic Conduit.

- B. Fittings shall be all steel plated hexagonal threaded fitting.

2.3 Flexible Metal Conduit and Fittings

- A. Flexible metal conduit shall be of the best grade interlocking spiral strip steel. The interlocking spiral strip construction shall be such as to permit bending of the conduit to a radius of four (4) times its internal diameter without distorting at any point. The interior and the exterior of the flexible conduit shall be smooth and free of burrs, sharp edges, or other defects which could damage the wire.
- B. Fittings shall be of the approved types, made of malleable iron and hot dipped galvanized.
- C. All connectors shall be steel compression fittings with insulated throats.
- D. Where water tight flexible conduit is required, it shall have an outer sheath of material similar to PVC.

2.4 Non-metallic Conduit

- A. Non-metallic conduit shall be UL listed, for its particular application. It shall be resistant to sunlight and chemical and moisture atmospheres, and rated for use with 90 degrees Celsius conductors.
- B. The installation and usage of rigid non-metallic conduit shall comply with Article 347 of the National Electrical Code, along with any related or referenced sections.

PART 3 - EXECUTION

3.1 General

- A. All conduit shall be run tight against walls, columns or ceilings.
- B. The conduit shall bend cold 90 degrees about a radius equal to ten (10) times its own diameter without signs of flaw or fracture in either pipe or protective coverings. All bends and offsets shall be made on a forming tool to prevent the conduit or its coating from being damaged in the bending. Conduit bends shall have a radius not less than ten (10) times the conduit diameter.
- C. Where conduits join any couplings or threaded fittings, the ends shall be made watertight. (All conduit runs, including boxes, couplings, and fittings used therein, shall be so installed and equipped as to prevent water from entering the conduit.)
- D. All conduits shall be carefully cleaned before and after erection. After cleaning, all ends of conduits shall be free from burrs and inside surfaces shall be free from imperfections likely to injure the wires or cables.
- E. In every instance, conduit shall be installed in such a manner that the conductors may readily and easily be drawn or pulled in without strain or damage to the insulation; and, also, so that defective conductors may be readily and easily withdrawn and replaced by new conductors. Long radius bends and a sufficient number of approved

pull and junction boxes shall be approved for this purpose, and as may be directed by the Engineer. All conduit shall be securely supported and grounded.

- F. In unfinished areas, exposed conduit shall be run to conform to the building lines with special emphasis on neatness. Turns shall be made with galvanized outlet boxes, junction boxes, factory fittings and/or symmetrical bends. Locknuts and bushings shall be employed to provide full grounding and adequate protection of insulation. Double locknuts shall be used on all conduits entering sheet metal enclosures.
- G. Support for all conduit shall be in accordance with the National Electrical Code. Conduit shall be supported by approved pipe straps or clamps, secured by means of toggle bolts on hollow masonry; expansion shields and matching screws or standard pre-set inserts on concrete or solid masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction. Powder actuated fasteners are not allowed on State projects.
- H. All empty conduit systems shall be capped or terminated in a junction box and shall be provided with nylon pull cord inside for future use.
- I. Conduit terminating below grade shall be provided with means to prevent entry of dirt or moisture. Depth of burial shall not be less than two (2) feet below grade. All termination points shall be accurately marked and dimensioned on the As-Built Plans.
- J. Where conduits of any type pass over a building expansion joint, a standard "expansion joint fitting" compatible with the type of raceway shall be provided.
- K. Conduits installed on the interior of exterior building walls shall be spaced off the surface a minimum of 1/4" using "clamp-backs" or strut.

3.2 Thin Wall Conduit and Fittings

- A. Except for service and feeder conduits, electrical metallic tubing and fittings may be installed in lieu of rigid conduit in dry construction in furred spaces, ceiling cavities, chase spaces, interior portions other than concrete and solid plaster, or for exposed work except on mechanical structure or supports.
- B. Electrical metallic tubing shall not be installed.
 - 1. Where exposed to severe corrosive conditions and/or severe physical damage,
 - 2. Nearer than four (4) feet from finished floor in exposed areas
 - 3. In trade sizes larger than two (2) inches
 - 4. Located in exterior walls or in poured concrete.
 - 5. Any location outdoors.
 - 6. Where tubing, coupling, elbows and fittings would be in direct contact with the earth or underground (in/below slab-on-grade or in earth).

- C. A transition between a run of rigid conduit concealed in a wall and a run of thin wall conduit along a ceiling shall be made in an outlet box above the ceiling, if accessible, near the wall.

3.3 Rigid Steel Conduit and Fittings

- A. All conduit terminations shall be provided with insulating bushings.
- B. Condulet fittings shall not be used in lieu of pull boxes.
- C. Except where located under the ground floor slab, all service and feeder conduit shall be heavy wall (rigid galvanized).
- D. Rigid steel conduit shall be installed in exterior masonry walls, in wet locations where subject to severe physical damage, or where conduit trade size is two and one half (2 1/2) inches or larger.

3.4 Flexible Metal Conduit and Fittings

- A. Flexible metallic conduit shall be provided at the end of each conduit run terminating at the conduit box on electric motors, transformers or other equipment.
- B. The length of flexible conduit shall be in accordance with the National Electric Code.

3.5 Non-Metallic Conduit

- A. Thin wall rigid non-metallic conduit (schedule 40 PVC) shall only be used for concrete encasement.
- B. Except where embedded in concrete, conduit shall be supported to permit adequate lineal movement to allow for expansion and contraction of conduit due to temperature change. Where a temperature change in excess of 14 degrees Celsius is anticipated, such as direct burial, exposed outside of the building, or in un-insulated spaces inside the building (attics, crawl spaces, etc.), expansion joints shall be installed in accordance with the manufacturer's specifications.
- C. Heavy wall non-metallic conduit (schedule 80 PVC) shall be used where conduits are direct buried exterior to the building or exposed exterior to the building.
- D. PVC schedule 40 shall not be used exposed or concealed in gypsum wall, but may be used in CMU walls. PVC schedule 40 may be used in elevated floor slabs and in foundation slabs. Minimum concrete cover shall be 3/4 inch at finished or formed surface and shall be 3 inches at concrete surface cast against earth or for slabs placed on-grade. Greater amounts of concrete cover shall be used in areas subject to damage. The placement of conduit in floor slabs must be thoroughly coordinated with the structural design. Potential conflicts with steel reinforcing bars and reductions in net concrete sections are among the issues that must be considered by the structural engineer.

3.6 Underground Raceways

- A. Where conduit is installed under the ground floor slab within the building foundations, schedule 40 PVC conduit shall be used. At the Contractor's option, this installation

may consist of galvanized steel conduit encased with three (3) inches of concrete or rigid steel conduit with a minimum of 15 mils of PVC coating. Where thin wall non-metallic conduit is used under the ground floor slab, the elbows and turn out required to turn the raceway up into cabinets, equipment, boxes, etc. shall be of rigid steel.

- B. Raceways run external to building foundation walls, with the exception of branch circuit raceways, shall be encased with a minimum of three (3) inches of concrete on all sides.
 - 1. Encased raceways must have a minimum cover of eighteen (18) inches, except for raceways containing circuits with voltages above 600 volts, which must have a minimum cover of thirty (30) inches.
 - 2. Encased raceways shall be of a type approved by the NEC as "suitable for concrete encasement."
- C. Branch circuit raceways run underground external to building foundation walls shall be run in raceways installed in accordance with the NEC, and shall be of a type approved by the NEC as "suitable for direct burial." Minimum raceway size shall be 1 inch.
- D. All underground raceways shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
- E. Raceways run underground internal to building foundation walls shall be of a type and installed by a method approved by the NEC.
- F. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the stub-up out of the slab or earth shall be of rigid steel.
- G. The raceway system shall not be relied on for grounding continuity.
- H. Where passing through a "below grade" wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" thru-wall fitting with "FSKA" membrane clamp adapter if required.

3.7 Ductbank

- A. Excavation and backfill shall conform to "Division 2" of the specifications except heavy-duty, hydraulic-operated compaction equipment shall not be used.
- B. Trenches should be cut neatly and uniformly, sloping uniformly to required pitch.
- C. Ducts should be pitched to drain toward manholes and handholes and away from buildings and equipment. Minimum slope shall be 4 inches in 100 feet. Where necessary to achieve this between manholes, ducts should be sloped from a high point in the run to drain in both directions.
- D. Concrete encased nonmetallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Separators to the earth and to ducts should

be secured to prevent floating during placement of concrete. Steel or tie wires should not be used in such a way as to form conductive or magnetic loops around ducts or duct groups.

- E. Waterproof marking cord should be installed 130-pound tensile test (marked at least every foot), equivalent to Greenlee No. 435, in all ducts, including spares, after thoroughly rodding, clearing and swabbing all lines free of any and all obstructions.
- F. All ducts should be sealed at terminations, using sealing compound and plugs, as required to withstand 15 psi minimum hydrostatic pressure.
- G. The arrangement of conduit in ductbank should be in accordance with OSHA requirements.

END OF SECTION 260545

SECTION 260533 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

- 1.1 Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project.
- 1.2 Furnish and install self-adhesive plastic tape for all receptacle and wall switch cover plates indicating circuit numbers.

PART 2 - PRODUCT

- 2.1 Nameplates:
 - A. Nameplates shall remain legible. Embossed, self-adhesive plastic tape is not acceptable for marking equipment.
 - B. Letters shall be approximately 1/2-inch high except where resultant nameplate size exceeds equipment size. Nameplate lettering may be adjusted accordingly with approval of the Engineer.
 - C. Nameplate material colors shall be:
 1. Blue surface with white core for 120/208-volts equipment.
 2. Black surface with white core for 277/480-volts equipment.
 3. Bright red surface with white core for all equipment related to fire alarm system.
 4. Dark red (burgundy) surface with white core for all equipment related to security.
 5. Green surface with white core for all equipment related to emergency systems^{1,2}.
 6. Orange surface with white core for all equipment related to telephone systems.
 7. Brown surface with white core for all equipment related to data systems.
 8. White surface with black core for all equipment related to paging systems.
 9. Purple surface with white core for all equipment related to TV systems.
- 2.2 Self-adhesive plastic tape:
 - A. All text shall be type written by the tape compatible equipment. No handwritten.

PART 3 - EXECUTION

- 3.1 Nameplates shall be securely attached to equipment using two-part epoxy adhesive suitable for location where installed. The Designer may specify attaching with self-tapping stainless-steel screws; if the screw sharp end is protected; or rivets. In outdoor locations, labels applied using two-part epoxy shall be weatherproof and sunlight resistant.

- 3.2 Designer shall confirm with the Owner identification of other systems, such as Legally Required and Optional Standby systems.
Notes
- A. Emergency systems are those defined by NEC Art 700; legally required and optional standby systems (defined under NEC Art 701 and 702 respectively) shall not be uniquely identified and shall retain the nameplate color consistent with their system voltage, i.e. blue for 120/208-volt and black for 277/480-volt.
 - B. Identification of the essential electrical system within Health Care Facilities (defined by NEC Art 517) shall be coordinated with the Facility Owner and compliant with NFPA 99.
- 3.3 All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.
- 3.4 All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings, where identification shall also include branch circuit designation.
- 3.5 The State Construction Office acknowledges certain existing state facilities may have been constructed under previous guidelines and policies having different equipment identification. Therefore, the Designer shall be responsible for confirming any identification system that differs from current guidance and obtaining direction from SCO as to the identification system to be implemented for any existing electrical systems that are retrofitted or modified.

END OF SECTION 260553

SECTION 262416 - PANEL BOARDS AND CIRCUIT BREAKERS

PART 1 - GENERAL

- 1.1 The Electrical Contractor shall provide all panelboards and circuit breakers as shown on the plans in accordance with this specification.
- 1.2 All equipment shall meet UL, NEC and NEMA Standards as applicable to the equipment specified herein.
- 1.3 All panelboards shall be equipped with a main circuit breaker or main lugs as indicated on the drawings.
- 1.4 All panelboards shall be equipped with branch breakers as shown on the drawings.
- 1.5 All panelboards identified on the drawings for use as service equipment shall be so labeled and UL listed for such use.
- 1.6 Full size insulated copper neutral bars shall be included in all panelboards. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
- 1.7 A copper ground bus shall be included in all panelboards.
- 1.8 All current-carrying parts of the bus assembly shall be copper with tin plating.
- 1.9 Panelboards shall be labeled with a UL short circuit rating not less than the rating indicated on the drawings.
- 1.10 The word "spare", unless noted otherwise on the panel schedules, shall be a single pole, 20 amp circuit breaker.
- 1.11 The word "space", unless noted otherwise on the panel schedules, shall be for a space in the panelboard for a standard size, single pole circuit breaker.
- 1.12 Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
- 1.13 Sub fed breakers are not acceptable.
- 1.14 Series rated panel boards or breakers are not acceptable.
- 1.15 All NEMA 1 panel boards shall have a hinged trim (Door in Door).
- 1.16 All panelboards shall have breakers, terminals, and Lugs UL approved use with 75°C rated conductors.

PART 2 - PRODUCT

2.1 This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	240	Maximum Branch Circuit	=	125 amps
Amps	=	600	Short Riding Circuit	=	22,000 amps

- A. Panelboards shall be Square D Company type NQ (bolt- on) or equivalent by Siemens, Eaton, or GE by ABB.
- B. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- C. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, UL and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
- D. Fronts shall include doors 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. Door shall be mounted by completely concealed steel hinges. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.
- E. Panelboard trims shall cover all live parts. Switching device handles shall be accessible.

2.2 This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage	=	480	Maximum Branch Circuit	=	125 amps
Amps	=	600	Short Circuit Rating	=	65,000 amps 480 VAC
				=	100,000 amps 240 VAC

- A. A. Panelboards shall be Square D Company Type NF (bolt- on) or equivalent by Siemens, Eaton, or GE by ABB.
- B. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- C. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, UL and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
- D. Fronts shall include doors 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. Door shall be mounted by completely concealed steel hinges. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door.

Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.

- E. Panelboard trims shall cover all live parts. Switching device handles shall be accessible

2.3 Molded Case Circuit Breakers

- A. This specification covers molded case circuit breakers rated 15 through 1200 amperes 120VAC, 240VAC, 277VAC and 480VAC. Breakers covered under this specification may be installed in switchboards, panelboards, motor control centers, combination motor starters, busway plugs and individual enclosures.
- B. Circuit breakers shall be manufactured by Square D Company of the size as indicated on the drawings or equivalent by Siemens or General Electric. All breakers shall be bolt-on type.
- C. All circuit breakers shall have a quick-make, quick-break over center toggle type mechanism. The handle mechanism shall be trip-free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breakers shall assume a position between on and off when tripped automatically. Multi-pole circuit breakers shall be common trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings shall be clearly visible.
- D. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Circuit breakers shall be calibrated to carry 100% rated current in an ambient of 40 degrees Celsius. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40 degrees Celsius, the circuit breaker automatically derates itself so as to better protect its associated conductor. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes 250 amps and above.
- E. The interrupting rating of each circuit breaker shall be as indicated on the drawings. The interrupting rating of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to UL listed integrated short circuit current rating specified for the panelboards and switchboards.
- F. UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120 V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.
- G. Motor starters, and other applications as indicated on drawings, shall be furnished with magnetic-only type molded case circuit breakers. Each breaker shall be provided with a single magnetic adjustment that will set all poles to the same trip current. Adjustment shall be continuous throughout the adjustable trip range. The magnetic trips shall be accessible from the front of these circuit breakers.

PART 3 - EXECUTION

- 3.1 Panelboards shall be flush or surface mounted as shown on the plans.
- 3.2 Panel enclosures shall not be used as junction or pull boxes for splicing conductors.
- 3.3 Each flush mounted panel shall be equipped with two empty one inch conduits sealed in the wall from a panel to a six inch square flush mounted box installed above a lay-in type ceiling or flush in the wall at the ceiling for a plaster or spline type acoustical tile ceiling.
- 3.4 All panels shall be equipped with neatly typed directory cards attached on the inside of the door.
- 3.5 GFI circuits shall be tested by the Contractor prior to the pre-final inspection.
- 3.6 Testing shall be performed by a qualified factory technician at the job site. All readings shall be tabulated by the contractor.
- 3.7 The number of branch circuit shall be identified with permanent wire tag attached to the wire.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

- 1.1 Switches, dimmer switches, photocell, contactors and receptacles, with proper cover plates, shall be provided where indicated on the Drawings.

PART 2 - PRODUCT

- 2.1 Switches, dimmer switches, photocell, contactors and receptacles shall be as specified in the Symbol Schedule of the Drawings.
- 2.2 All switches and receptacles shall be federal specification grade meeting NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL-498 and shall be approved third-party listed.
- 2.3 Switches and receptacles shall be as manufactured by Hubbell, Pass and Seymour, or Leviton. Photocells shall be manufactured by Tork, Paragon, Bryant, or equivalent.
- 2.4 Cover plates for all wall mounted devices shall be provided as scheduled on the Drawings. Where covers are not specified, they shall be as follow:
- A. Interior: type 302 stainless steel. Cover plate mounting screws shall be slotted head oval screws and shall match the finish and material of the plate, and shall be furnished with the plate by the plate manufacturer.
 - B. Exterior, exposed work and wet locations: cover plates shall be extra-duty rated (NEC 406.9(B)(1)) galvanized cast ferrous metal, standard size, and shall be single or ganged as indicated on the drawings. Exterior mounted switch and receptacle plates, and those noted to be weatherproof, shall be weatherproof cover plates, standard size, single or ganged as indicated on the drawings, and shall be "approved" third party listed as "rain-tight while in use."
- 2.5 All devices shall have a hex-head green grounding screw for use in connecting device to green grounding conductor run in the conduit system.
- 2.6 All GFI devices shall be the feed through type.
- 2.7 All standard duplex receptacles shall be 20 amp, 125 volt rated.
- 2.8 All devices subject to use in a wet location shall be listed as weather resistant.
- 2.9 All switches shall be rated 20 amp, 120/277 volt. Toggle switches shall have quiet operating mechanisms without the use of mercury switches.

PART 3 - EXECUTION

- 3.1 Mounting height shall be as indicated on the Drawings. Coordinate with other trades so that devices will miss equipment installed by others.
- 3.2 Where two or more devices are ganged, they shall be in a common box with a ganged plate.
- 3.3 All devices shall have a green ground conductor to run parallel with the phase conductor back to the electrical panel.
- 3.4 In all areas where carpet is to be installed as finished floor material, unless otherwise specified, the Electrical Contractor will furnish solid brass carpet flanges for installation on floor outlet boxes. Flanges will be furnished and installed on all active outlets after the carpet is installed. Where a specified number of outlet fittings are to be furnished to the Owner, for each fitting not installed during the construction period, it will be turned over to the Owner with the receptacle, carpet flange and all necessary appurtenances.
- 3.5 All receptacles mounted above counters, backsplashes shall be mounted horizontally unless otherwise noted on plan.
- 3.6 Provide quantity of 2% spare cover plates of each type to the owner.

END OF SECTION 262726

SECTION 262727 - DISCONNECTS

PART 1 - GENERAL

- 1.1 Disconnect switches shall be provided where indicated on the drawings, or as required by the National Electrical Code (NEC).

PART 2 - PRODUCT

- 2.1 Disconnects shall be heavy duty as manufactured by Square D Company, Siemens, Eaton, GE by ABB, or approved equivalent.
- 2.2 Disconnects shall be furnished with factory finish paint and appropriate knockouts for conduit connections.
- 2.3 All disconnects shall have side hinged type doors. Front operated handles will not be permitted.
- 2.4 All fused disconnects shall be equipped with positive pressure fuse clips and shall have visible disconnecting blade switches.
- 2.5 NEMA 1 enclosures shall be provided where installed indoors. NEMA 3R enclosures shall be provided where exposed to the elements, unless noted otherwise.
- 2.6 All disconnects shall have copper bus.
- 2.7 Disconnects shall have provisions for locking in on and off positions.
- 2.8 Disconnects shall have defeatable door interlocks that prevent the door from opening when the operating handles is in the "on" position.
- 2.9 Disconnects shall have handles whose positions are easily recognizable in the "on" or "off" position. For safety reasons, padlock shall be provided for switches located in the public areas.

PART 3 - EXECUTION

- 3.1 Disconnect switches shall be mounted as indicated on the Drawings and shall be independently supported. Conduits entering the disconnect switch shall not be used to support switches.
- 3.2 Where fused disconnect switches are required or shown on the plans, standard Fusetron fuses shall be used unless the switch protects an individual motor circuit, then dual element Fusetron fuses shall be used.
- 3.3 The electrical contractor shall provide to the owner the spare fuses, 10% of the quantity of fuses used of each type and rating, with a minimum of one set of each type.

END OF SECTION 262727

SECTION 263213 – STANDBY POWER GENERATOR SET

PART 1 - GENERAL

- 1.1 The Contractor shall furnish a standby power generator set as indicated on the drawings and contained herein. The Contractor shall supply all parts for a complete, functioning generator set.
- 1.2 All materials, equipment, and parts comprising the units specified herein, shall be new and unused, of current manufacture and of highest grade.
- 1.3 The engine, generator and all major items of auxiliary equipment shall be manufactured by manufacturers currently engaged in the production of such equipment. The unit shall be furnished by an authorized dealer having a parts and service facility within 150 miles of the project site.
- 1.4 The generator set shall be manufactured by Caterpillar, Detroit Diesel, Kohler or Generac.

PART 2 - PRODUCT

2.1 Generator Set Characteristics

- A. Rating @ 1800 RPM. The rating of the engine-generator system shall be based on operation of the set when equipped with all necessary operating accessories such as radiator fan, air cleaners, etc.
 1. Standby power KW with fan shall be as shown on plan.
 2. Standby power KVA with fan shall be as shown on plan.
 3. Voltage 208/120 Volts
 4. Power factor .8
 5. Frequency 60 hertz
- B. These ratings must be substantiated by manufacturer's standard published curves. Special ratings or maximum ratings are not acceptable.
- C. Set shall be capable of continuous operation for a minimum period of 30 days without damage at the standby rating.
- D. The generator shall be UL2200 listed.

2.2 Engine

- A. The engine shall be water cooled inline or Vee-type, four cycle compression ignition diesel. It shall meet specifications when operating on No. 2 domestic burner oil (ASTM D396). Diesel engines requiring premium fuels will not be considered. The engine shall be equipped with fuel, lube oil, and intake air filters, lube oil cooler, fuel transfer pump, fuel priming pump and water pump.

- B. The engine electronic governor shall maintain frequency regulation not to exceed +/- .25% (isochronous) from no load to full rated load.
- C. The unit shall be mounted on a structural steel sub- base and shall be provided with vibration control by use of integral means or spring-type isolators as recommended by the manufacturer.
- D. Safety shut-offs for high water temperature, low oil pressure, overspeed, and engine overcrank shall be provided.
- E. Engine shall be an EPA Tier type with rating as required by law.

2.3 Generator

- A. The generator shall be a salient pole brushless, synchronous alternator, continuous rated, .8 P.F. with KW and KVA rating as shown on plan. The unit shall be the single bearing type. This assembly shall be compact, sturdy and free from vibration and with a minimum noise level. The generator rotating speed shall not exceed 1800 revolutions per minute.
- B. Stator insulation shall be Class "F", rated for 80 degrees Celsius rise by resistance above a 40 degrees Celsius ambient, continuous duty. The stator windings shall be designed for an output of 3 phase, 60 hertz, and 208/120 volts and shall have an overload capacity of 25% for two (2) hours out of any twenty-four (24) hour period.
- C. The generator-exciter-regulator package shall provide a voltage regulation of plus and minus 1% of rated voltage. Voltage regulation shall apply to any load from no load to rated load at rated power factor, and is defined as a change in the output voltage after all transients, due to load change, have decayed to zero.
- D. With the generator operating at rated speed, rated voltage, no-load, the sudden application of rated load, rated power factor shall not cause a transient voltage deviation of more than 15% from rated voltage. Following such a sudden load change, the voltage shall recover to and remain within the regulation band within 2 seconds.
- E. Amortisseur windings with the end plates connected between poles shall be included for minimized harmonic content, good transient performance and to provide paralleling capability.
- F. The bearings shall be so located as to enable replacement without disturbing the exciter-rectifier- rotor assembly. The generator shaft shall be sufficiently rigid to avoid torsional vibration. The torsional analysis of the shaft shall be done by the engine supplier. The generator shall be equipped with an adequately sized conduit box for making external connections to the connected load.
- G. Voltage regulation shall be accomplished by an automatic volts-per-hertz type, solid state, exciter/regulator shock mounted inside the generator.
- H. A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not automatically reset preventing restoration of voltage if maintenance is being performed. Field current- sensing breaker will not be acceptable.

2.4 Cooling System

- A. An engine-mounted radiator with blower type fan shall be sized to maintain safe operation at 110 degrees Fahrenheit maximum ambient temperature. The radiator shall be equipped with a duct adapter flange. Air flow restriction from the radiator shall not exceed 0.5" H₂O. The Contractor shall provide ductwork with flexible connecting section between radiator duct flange and discharge louver frame.
- B. Intake louvers shall be sized and located to provide sufficient intake air for engine combustion, ventilating air, and to provide required air flow through the radiator. These louvers shall be by the Electrical Contractor unless noted otherwise.
- C. The engine cooling system shall be filled with a solution of 50% ethylene glycol.

2.5 Fuel System

- A. Provide sub-base, double walled fuel tank with leak detection.
- B. Tank shall be sized for continuous 24 hour operation at full load.
- C. Tank shall be UL142 labeled and shall be international Fire Code compliant.
- D. Provide a 5 gallon fuel fill containment basin complete with a drain and locking lid installed inside the enclosure.
- E. Provide a 2" tank inlet spout adapter with crossbar plus a 2" quick disconnect fill coupler for tanker truck connection.
- F. Over fill protection valve to stop filling at the 95% level.
- G. Float switch set at 90% full and wired to a visual alarm signal.
- H. Provide a permanent sign at the fill point of the tank documenting the filling procedure and the tank calibration chart.

2.6 Exhaust System

- A. A suitable silencer of the reactive type shall be furnished with the engine. Critical 25-30 DbA reduction.
- B. A stainless steel bellows type exhaust adaptor at least 18 inches long shall be furnished for each exhaust outlet to the silencer.

2.7 Automatic Starting System

- A. A 12 or 24 volt DC electric starting system with positive engagement drive shall be furnished.
- B. Fully automatic generator set start/stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, overspeed, overcrank, and one auxiliary contact for activating accessory items. Controls shall include a 30 second single cranking cycle limit with lockout.
- C. A unit mounted thermal circulation type water heater shall be furnished to maintain engine jacket water to 90 degrees Fahrenheit in an ambient temperature of 30 degrees

Fahrenheit. The heater shall be single phase, 60 Hertz, 120 volts, not to exceed 1500 watts.

2.8 Batteries

- A. The batteries shall be 12 volt maintenance free, lead acid type of suitable capacity to provide 90 seconds of total cranking time at 0 degrees Fahrenheit without recharging and will be rated per manufacturer's recommendation.
- B. The battery will be supplied with all necessary intercell and intertray connectors, battery rack, cables, and clamps, charged and ready for service.

2.9 Battery Charger

- A. The charger shall be rated at no less than 10 amps and employ transistor controlled magnetic amplifier circuit to provide continuous taper charging.
- B. The charger shall maintain rated output voltage with A.C. line fluctuations of +/- 10%.
- C. The charger shall contain:
 - 1. Two ranges, float at 1.4 V.P.C. and equalize at 1.6 V.P.C. on maintenance free lead acid batteries.
 - 2. Automatic A.C. line compensation.
 - 3. Automatic overload protection (current limiting).
 - 4. Silicon diode full-wave rectifiers.
 - 5. Automatic surge suppressors.
 - 6. D.C. ammeter and voltmeter.
 - 7. Fused A.C. input and D.C. output.
 - 8. Low D.C. voltage alarm relay.
 - 9. High D.C. voltage alarm relay.
- D. A.C. input voltage shall be 120 volt A.C.

2.10 Generator Control Panel

- A. A generator mounted NEMA 1 type vibration isolated control panel made from 14 gauge steel shall be provided on the unit, unless otherwise noted.
- B. Panel shall contain, but not be limited to, the following equipment:
 - 1. Voltmeter, 3 1/2", 2% accuracy.
 - 2. Ammeter, 3 1/2", 2% accuracy.

3. Ammeter/Voltmeter phase selector switch.
4. Frequency meter, 3 1/2", dial type.
5. Automatic starting controls as specified in 7.b.
6. Panel illumination lights and switch.
7. Voltage level adjustment rheostat.
8. Engine oil pressure gauge.
9. Engine water temperature gauge.
10. Fault indicators for low oil pressure, high water temperature, over speed, over crank, and not in "auto" position.
11. Four position function switch; "auto", "manual", "off/reset", and "stop"
12. Battery charging ammeter.
13. One set of louver contacts.
14. Running time meter.
15. Provide the following for remote monitoring.
 - a. A modem
 - b. 4 contact inputs, 2 analog inputs, 4 relay outputs all pre-wired.
 - c. RS232 and RS485 communication ports.
 - d. Controller shall be able to communicate via mod bus to customer's network or building management system. Provide a converter so this port may be set up to become an IP address on the customer's network.

2.11 Main Line Circuit Breaker

- A. A generator mounted main line molded case circuit breaker rated amps as shown on plan shall be installed as a load circuit interrupting and protection device. It shall operate both manually for normal switching function and automatically during overload and short circuit conditions. Shunt trip to activate on engine fault condition.
- B. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breaker shall meet standards established by Underwriters' Laboratories, National Electric Manufacturer's Association, and National Electrical Code.
- C. Generator exciter field circuit breakers do not meet the above electrical standards and are unacceptable for line protection.

2.12 Pre-Alarm Module

- A. A generator control panel mounted pre-alarm module shall be provided to meet NFPA 76A.
- B. It shall provide audible and visual alarm warning of impending fault conditions and provide audible warning on fault shutdown.
- C. Provide a Beacon and horn to signal fault shut down.

2.13 Provide standard sound attenuated weatherproof enclosure. The enclosure shall be designed to reduce source noise to an average of 25 dba at 7 meters.

PART 3 - EXECUTION

- 3.1 The generator set shall be warranted by the generator set manufacturer for one year from the date of acceptance. The warranty shall cover all parts and labor. Extended warranty and maintenance shall be made available to the Owner after the date of acceptance.
- 3.2 The generator set shall receive the manufacturer's standard factory load testing. Prior to acceptance of the installation, equipment shall be tested to show that it is free of any defects, and will start automatically, and be subjected to full load test, or that load which is available at the job site.
- 3.3 On completion of the installation, start-up shall be performed by a factory-trained dealer service representative. A letter shall be written to the Engineer from the factory-trained dealer, certifying that the system has been installed and field tested to meet the above performance requirements.
- 3.4 Operating and maintenance instruction books shall be supplied upon delivery of the unit and procedures explained to operating personnel.
- 3.5 Provide a 12" high concrete pad of sufficient size and structure to support the generator and enclosure.
- 3.6 The fuel tank shall be full at the completion of the project.
- 3.7 Contractor is responsible for testing the fuel tank and fuel lines in accordance with the Fort Bragg Fire Chief's requirements.

END OF SECTION 263213

SECTION 263623 - AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

- 1.1 The Contractor shall furnish an automatic transfer switch as shown on the drawings and as specified herein.
- 1.2 When an emergency generator system or prime power system is furnished as part of the work, the subcontractor furnishing the generator equipment shall furnish the automatic transfer switch.
- 1.3 Transfer switch(es) shall be as manufactured by Generac, Zenith, Kohler or ASCO.
- 1.4 The automatic transfer switch shall be contactor type, with arc suppression chutes.

PART 2 - PRODUCT

- 2.1 The transfer switch(es) shall be three (3) poles, 208 volts with current rating as shown on plan for three (3) phase, four (4) wire system (solid neutral). Standard open transition type (break before make connection). The transfer switch(es) shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a NEMA 1 or NEMA 3R enclosure constructed in accordance with Underwriters' Laboratories, Inc. Standard UL-1008.
- 2.2 Automatic Operation: Transfer switch(es) shall automatically sense loss of line power whether the power has been cut off completely or simply dropped below 70% of the rated voltage level. After the loss of line power has been sensed, the transfer switch shall activate the engine start circuit and automatically transfer the load to the standby generator when power becomes available. When normal power returns, the transfer switch shall automatically transfer the load back to the normal source and signal the generator to shut down. The operating transfer time in either direction shall not exceed 1/6 of a second.
- 2.3 Contacts shall be silver alloy to prevent sticking and welding. Mechanism shall provide quick positive action in opening and closing circuits. All contacts and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.
- 2.4 The control module shall be on separate panel mounted directly below switching mechanism. Sensing and control logic shall be solid-state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial control grade plug-in type with dust covers and locking clips.
- 2.5 The automatic transfer switch shall conform to the requirements of Underwriters' Laboratories UL-1008 and shall be UL listed as follows:
 - A. For use in emergency systems in accordance with Articles 700 of the National Electrical Code.
 - B. Rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric- heating and tungsten-filament lamp load.

- 2.6 The automatic transfer switch shall be rated to withstand the RMS symmetrical short circuit current available at the automatic transfer switch terminals with the type of overcurrent protection and voltage as shown on the plans.
- 2.7 The transfer switch(es) shall be equipped with a manual operator that is designed to prevent injury to the operating personnel if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.
- 2.8 The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing.
- 2.9 The switches shall include voltage and frequency sensing of the emergency source and shall be factory set to allow transfer to emergency when that source is at approximately rated voltage and frequency.
- 2.10 Approval Required
 - A. As a precondition for approval, the transfer switch(es), complete with timers, relays and accessories shall be listed by Underwriters' Laboratory, Inc. in their Electrical Construction Materials Catalogue under Standard UL-1008 (automatic transfer switches) and approved for use on Emergency Systems.
 - B. On request, the manufacturer shall provide a letter certifying compliance with all requirements of the transfer switch specifications. The certification shall identify equipment by serial number and shall include no exceptions to the specifications not stipulated with the submittal.
- 2.11 The automatic transfer switch shall also be equipped with an exerciser to start the generator and transfer the load for a period of thirty minutes once a week. After thirty minutes, the transfer switch shall switch back to the utility power source.

PART 3 - EXECUTION

- 3.1 Sequence of Operation
 - A. Engine starting contacts shall be provided to start the generating plant if any phase of the normal source drops below 70% of rated voltage, after a non- adjustable time delay period of 3 seconds, to allow for momentary dips.
 - B. The transfer switch shall transfer to emergency as soon as the voltage and frequency have reached 90% of rated. After restoration of normal power on all phase to 90% of rated voltage, an adjustable time delay period of 0-30 minutes shall delay retransfer to normal power until it has had time to stabilize.
 - C. If the emergency power source should fail during the time delay period, the time delay shall be bypassed, and the switch shall return immediately to the normal source. After the switch has retransferred to normal, the engine-generator shall be allowed to operate at no load for an adjustable period of time (0-5 minutes) to allow it to cool before shutdown.

- D. The transfer switch(es) shall include a test switch to simulate normal power failure, pilot lights on the cabinet door to indicate the switch closed on normal or emergency, and two (2) auxiliary contacts on the main shaft; one closed on normal, the other closed on emergency.
- E. In addition, one set of relay contacts shall be provided to open upon loss of normal power supply.
- F. All relays, timers, control wiring and accessories to be front accessible.

3.2 Submittal, Operator's Manual and Warranty

- A. Submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams; dimension drawings; and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
- B. Each transfer switch shall be provided with an operator's manual providing installation and operating instructions.
- C. The automatic transfer switch and generator set shall be warranted by the generator set manufacturer for one year from the date of acceptance. The warranty shall cover all parts and labor. Extended warranty offers shall be made available to the Owner after the date of acceptance.

3.3 A letter of certification from a factory representative shall be furnished to the Engineer stating that the automatic transfer switch(es) has been installed in accordance with the manufacturer's instructions, and that the switch has been tested for compliance with the above performance requirements.

3.4 For additional requirements see "Requirements for Permanently Installed Emergency Generator Systems" as published by the NC Department of Insurance. In instances where this specification conflicts with the above document, the more stringent requirement shall govern.

END OF SECTION 263623

SECTION 265100 - LIGHTING FIXTURES

PART 1 - GENERAL

- 1.1 The Contractor shall provide all fixtures and lamps where indicated on the Drawings.
- 1.2 Work shall include all stems, canopies and accessories necessary for a complete lighting fixture installation.
- 1.3 No PCB ballasts shall be accepted.
- 1.4 All lighting systems shall comply with the 2018 North Carolina State Energy Code and North Carolina Senate Bill 1946 and G.S. 143-64.17.

PART 2 - PRODUCT

- 2.1 Fixtures shall be as specified in the Fixture Schedule on the Drawings or approved equivalents.
- 2.2 All outdoor fixtures shall bear the approved third party test label for damp or wet locations as applicable. Where the ambient falls below 50°F that all fluorescent lamps and ballasts shall be rated for operation at 0°F.
- 2.3 Unless otherwise noted, all fixtures shall be new, free of defects and imperfections. Damaged fixtures shall be replaced at this Contractor's expense.
- 2.4 All acrylic lenses for lay-in troffers and wrap around fixtures shall have a nominal lens thickness of 0.125" unless noted otherwise on plans.
- 2.5 LED Luminaries:
 - A. LED driver manufacturers should have a minimum of five years of experience with the manufacture of LED drivers. All drivers shall have a minimum warranty of five years.
 - B. Where dimming is required, fixtures shall be dimmable down to 1% with standard 120/277 volt, electronic, low voltage dimmers.
 - C. Minimum color rendering index (CRI) shall be 80. Color temperature and performance shall conform to the parameters established by ENERGY STAR SSL standards (refer to ANSI-C78.377-2008).
 - D. Optical design shall be low glare, 50% cut-off.
 - E. Rated for 50,000 hours at 70% lumen maintenance.
 - F. LED driver shall be high efficiency with a minimum power factor of .90
 - G. 5 year, 100% warranty coverage for the driver, LED module, housing and trim. For the 1st year this shall be a complete parts and labor warranty. The 4th and 5th years shall cover parts only.
 - H. Total harmonic distortion: ≤ 20% (at full luminaire output and across specified voltage range)

- I. Transient and surge protection: ANSI C62.41-2002 Category A surge protection standards up to and including 2.5 kV for interior fixtures.
 - J. Sound: Class A not to exceed a measured value of 24dB.
 - K. Maximum standby power: 1W
 - L. LED arrays in the product(s) will be considered defective in material or workmanship if a total of 10% or more of the individual light-emitting diodes in the product(s) fail to illuminate during normal operation after installation.
- 2.6 Emergency Exit Lights per the State Construction Office requirements.
It shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, N.C. Building Code, Energy Code, NFPA-101, and NEMA Standards.
- A. Battery
It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and – negative terminal.
 - B. Charger
It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.
 - C. Additional Features
Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer rely.
 - D. Warranty
The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.
 - E. LED
The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.
 - F. Unit Test
Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, in accordance with NEC 700. The battery test shall be done 10 days prior to final

inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced, and tested again. Copy of the test report shall be included with the project record documentation.

- 2.7 Emergency Lights per the State Construction Office requirements
Shall be completely self-contained, provided with maintenance-free 12 volt battery, automatic charger, two lamps and other features. Fixture shall be third party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, N.C. Building Code, UL 924, NC Energy Code, NFPA-101, and NEMA Standards.
- A. Additional Features
Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer rely. If fluorescent emergency unit is used, a LED charging indicator light must be easily visible after installation and a remote test switch shall be installed adjacent to the fixture.
 - B. Battery
It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degrees C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and -negative terminal.
 - C. Charger
It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included in LEAD battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.
 - D. Warranty
The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contact document.
 - E. Unit Test
Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, in accordance with NEC 700. The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced, and tested again. Copy of the test report shall be included with the project record documentation.

PART 3- EXECUTION

- 3.1 All fixtures shall be installed in accordance with the National Electric Code.
- 3.2 All fixtures other than the lay-in type shall be individually supported from building structure with 1/4" threaded rods and nuts.

- 3.3 Where a recessed or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the luminaire and the other end to the building's structural system. The lay-in luminaire shall then be screwed to the main runners of the lay-in ceiling track at all four (4) corners using sheet metal screws. For fire rated suspended ceiling, luminaire shall be supported to the Building Structure as per the Ceiling Design Criteria, luminaire shall then be screwed to the main runners of the suspended ceiling track at all four (4) corners using sheet metal screws.
- 3.4 The complete emergency lighting system shall be tested by throwing the circuit breakers feeding the emergency lighting circuits. One and one-half hours thereafter, the battery voltages shall be recorded in a report to be submitted to the Engineer. This test shall be performed just prior to final inspection, under witness of the state electrical inspector, and in accordance with NEC Articles 700.4 (A) and (D).

END OF SECTION 265100

SECTION 274100 – AUDIO VISUAL SYSTEMS

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 all audio visual systems. Contractor shall validate exact locations and installation of equipment, power, data, conduit, and raceway systems.

1.3 SUBMITTALS

- A. Product Data: Include detailed manufacturer's specifications for each component specified. Include data on features, ratings, and performance.
- B. Maintenance Data: Provide original equipment installation manuals and warranty documentation to the Owner for inclusion in the overall project maintenance manuals. Provide print and digital PDF copies of documentation.
- C. Warranty: Submit audio visual equipment manufacturer's equipment warranties for review.

1.4 REGULATORY REQUIREMENTS

- A. All equipment and materials shall be UL listed or equivalent and shall bear the UL or equivalent label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.
- B. All equipment and installations under this contract shall conform to the following:
 - 1. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 2. ANSI/NFPA 70 - National Electrical Code.
 - 3. ANSI/IEEE C2 - National Electrical Safety Code.
 - 4. TIA/EIA Standards 568-A (including TSB-67), 569 and 607.
 - 5. Additional State and Local Code Requirements, as applicable.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by Manufacturer for installation of units required for this Project.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements and are based on the Manufacturers indicated.

1. Do not modify requirements, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data for Architect to review.

1.6 SUBMITTALS

- A. Product Data: Include detailed manufacturer's specifications for each component specified. Include data on features, ratings, and performance.

1.7 PROJECT CONDITIONS

- A. The Contractor shall, without cost to the Owner/Consultant, replace any products damaged during storage, handling or during installation.
- B. If conditions exist on the jobsite which make it impossible to install work as shown on the drawings or detailed in the specifications, recommend solutions and submit drawings showing how the work may be installed as well as an adjusted new schedule to the Consultant and Owner for approval.

1.8 DELIVERY STORAGE AND HANDLING

- A. The Contractor shall carefully control handling and installation of all items which are not replaceable, so that completion of the work will not be delayed by hardware or equipment losses before, during, and after installation. The Contractor is responsible for all items until Final Acceptance.
- B. The Contractor shall, prior to installation, protect exposed surfaces with material which is easily removed without marring finishes.
- C. The Contractor shall, without cost to the Owner, replace any products damaged during storage, handling or during installation.

1.9 WARRANTY

- A. All equipment provided by the Contractor shall be installed per manufacturer's specifications and warranted by the Contractor for a period of one (1) year from the date of written acceptance to meet all performance requirements outlined herein. Warranties shall not be pro-rated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Electronic component models shall be commercially available for a least one (1) year prior to bid, or be approved by the Architect.
- B. All equipment and material shall be new.
- C. All equipment must be UL listed or built to UL standards, where required.

2.2 BASIS OF DESIGN

- A. Audio Visual systems functionality, fit and conformance with client standards is based upon the following list of products. The Referenced Basis of Design Manufacturer is Listed to convey to the Bidders the general appearance, size, type, features, performance characteristics, and quality of the product desired.
- B. Other manufacturer's products may be incorporated; however, all products must be equivalent, or better, in functionality and performance specification to that shown here, and be from the list of alternate manufacturer.
- C. **Audio Visual Device Schedule**

Audio Visual Device	Quantity	Location (Quantity Per Space)	Basis of Design Manufacturer	Product Name	Other Acceptable Manufacturers
85-Inch Television Display	Three (3) Total	Room 120 (1) Room 128 (2)	Samsung	Samsung 85-Inch Class QLED 4K QN90D Series Neo Quantum HDR+ Smart TV w/Dolby Atmos, Object Tracking Sound+, Motion Xcelerator, Real Depth Enhancer Pro, Alexa Built-In Model Number: QN85QN90DAF, 2025 Model	Sony, LG
55-Inch Television Display	Three (3) Total	Room 110 (1) Room 113 (1) Room 210 (1)	Samsung	Samsung 55-Inch Class QLED 4K QN90D Series Neo Quantum HDR+ Smart TV w/Dolby Atmos, Object Tracking Sound+, Motion Xcelerator, Real Depth Enhancer Pro, Alexa Built-In Model Number: QN55QN90DAF, 2025 Model	Sony, LG
TV Wall Mount Bracket for Use with 47-Inch and 90-Inch Television Displays	Six (6) Total	Room 120 (1) Room 128 (2) Room 110 (1) Room 113 (1) Room 210 (1)	USX Mount	TV Mount Bracket, Full Motion Swivel Articulating Tilt Model Number: Model WML016-01	Chief, Peerless, Premier

Audio Visual Device	Quantity	Location (Quantity Per Space)	Basis of Design Manufacturer	Product Name	Other Acceptable Manufacturers
HDMI Cables	Six (6)		Crestron	CBL-HD-6	Crestron, Extron, C2G

- D. Substitutions: Material substitutions will be considered during the bidding phase until seven (7) days prior to the receipt of bids. No substitutions will be considered after seven (7) days prior to the receipt of bids. For material substitutions submit the following information to the Architect for review:
1. Name of Manufacturer.
 2. Address and Phone Number of Manufacturer.
 3. Manufacturer Product, Performance, Test Data, and Reference Standards.
 4. Detailed Comparison to Specified Product Including: Performance, Test Results, Warranties, Materials, Finish, and Other Pertinent Data.

2.3 ROOM DESCRIPTIONS

- A. Admin Room 110
1. One (1) 55-Inch Television Display attached to the wall by a TV Mount Bracket with Full Motion Swivel Articulating Tilt functions. HDMI Cable.
- B. Ops Room 113
1. One (1) 55-Inch Television Display attached to the wall by a TV Mount Bracket with Full Motion Swivel Articulating Tilt functions. HDMI Cable.
- C. Conference Room 120
1. One (1) 85-Inch Television Display attached to the wall by a TV Mount Bracket with Full Motion Swivel Articulating Tilt functions. HDMI Cable.
- D. Training / Command Room 128
1. One (1) 85-Inch Television Display attached to the wall by a TV Mount Bracket with Full Motion Swivel Articulating Tilt functions. HDMI Cable.
- E. Office 210
1. One (1) 55-Inch Television Display attached to the wall by a TV Mount Bracket with Full Motion Swivel Articulating Tilt functions. HDMI Cable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with installer present, for conditions affecting the performance and installation of the audio-visual equipment.
 - 1. Prepare a written report, endorsed by the Installer, listing conditions detrimental to performance of the audio-visual equipment.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 3. Prior to connecting any audio-visual equipment to 120VAC circuits, test and record the following:
 - a. Voltage between technical system isolated ground and bonded non-isolate ground if applicable.
 - b. Voltage between hot/neutral, hot/ground, and neutral/ground.
 - c. Grounding.
- B. Any discrepancies that may impact the audio-visual installation should be communicated to the Architect immediately upon inspection.

3.2 INSTALLATION, GENERAL

- A. Install audio visual equipment according to manufacturer's written instructions.
- B. Mount all equipment plumb and level.
- C. Permanently install all equipment to be firmly mounted and held in place. Provide necessary equipment supports to hold and support loads.
- D. Validate bracing and blocking for proper mounting and safety.

3.3 MOUNTING TO BUILDING STRUCTURE

- A. Use attachment hardware with a minimum SAE Grade 8 load rating and a safety factor of at least 5.

3.4 FLAT PANEL DISPLAYS AND TELEVISIONS

- A. All flat panel displays and televisions must be horizontally level but may be vertically angled to viewing audience.
- B. Installer must notify the Architect if proper ventilation has not been provided for the flat panel displays and televisions.

- C. All devices or interfaces that are associated with the flat panel display/television are to be neatly mounted behind the display/television and out of sight from the viewing audience.
- D. All cables must be neatly bundled in black expandable braided sleeving behind the display. These cables must not be visible from the viewing area of the display.

3.5 JOBSITE ETIQUETTE AND CLEANUP

- A. Jobsite shall be kept neat and orderly.
- B. All debris created as a result of the installation shall be removed daily. This includes scrap and associated materials.
- C. Use caution when working on or around furniture and millwork. Use protective material such as a blanket, cardboard, etc. Any damage will be the responsibility of the Data/Voice Contractor to repair.
- D. Daily cleanup includes vacuuming all debris in the work area.

END OF SECTION 274100

SECTION 283100 - ADDRESSABLE FIRE ALARM AND SPRINKLER ALARM SYSTEM

PART 1 - GENERAL

- 1.1 This document includes the furnishing, installation, and connection of the microprocessor controlled; intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring.
- 1.2 The fire alarm system shall comply with applicable provisions of the NC Building Code, NFPA 70 - National Electrical Code (NEC), NC Fire Code, and NFPA 72 -National Fire Alarm and Signaling Code. The Contractor shall furnish all parts, materials, and labor customarily required or provided for a complete and operating system, in accordance with all requirements applicable, even if each needed item is not specifically shown or described in the project plans or specifications.
- 1.3 Systems are to be provided with a separate and independent source of secondary power. All systems that report to a Central or Remote Supervising Station shall have a minimum of 24 hours battery power capacity, plus 5 minutes of full alarm load.
- 1.4 QUALITY ASSURANCE
 - A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled. Products of firms that do not maintain factory authorized service organization and spare parts stock are not acceptable for use
 - B. Acceptable Manufacturers: Simplex, EST, Siemens, FireLite, Notifier or other approved equivalents.
 - C. Installer's Qualifications: Company specializing in performing the work and making the final terminations and connections. Minimum of 5 years documented experience installing fire detection and alarm systems similar in size and scope to the project. Only the Installer may make program changes and must be present for the 100% test, Designer's pre-final review and Owner inspections.
 - D. All connections to the FACP/SACP and the system's programming shall be done only by the manufacturer, or by an authorized distributor that stocks a full complement of spare parts for the system. The technicians are required to be trained and individually certified by the manufacturer, for the FACP/SACP model/series being installed. This training and certification must have occurred within the most recent 24 months, except that a NICET Level III certification will extend this to 36 months. Copies of the certifications must be part of the Shop Drawing submittal to the Designers, prior to installation. The submittal cannot be approved without this information.
 - E. The person that programmed the system must be present for the Engineer's (and State Construction Office, as applicable for state projects) final inspection.
 - F. NFPA Compliance: Comply with applicable requirements of NFPA-72, National Fire Alarm and Signaling Code.

- G. NEC Compliance: Comply with applicable requirements of NFPA-70, National Electrical Code (NEC) standards pertaining to fire alarm systems.
- H. Comply with applicable requirements of NC Building Code and NC Fire Code.
- I. Testing Laboratory Compliance: Comply with provisions of UL safety standards pertaining to fire alarm systems. Provide products and components which are Listed and Labeled.
- J. FM Compliance: Provide fire alarm systems and accessories which are FM approved.

1.5 Definitions:

- A. Authority Having Jurisdiction (AHJ).

For State-owned facilities in North Carolina the AHJ for Code compliance is the NC Department of Administration – State Construction Office. The AHJ for construction administration and inspection purposes is the engineer of the record. The AHJ for code compliance is the NC Department of Administration – State Construction Office.

- B. Fire Alarm Control Panel (FACP) - Also called a Fire Alarm Control Unit (FACU) by some entities. See requirements in Part B.
- C. Remote Annunciator (FAA/SAA) – Provides LCD display with a text statement of the panel status and/or LED lamps to indicate the status of the fire alarm system. It is provided to assist fire fighters who respond to a call and to assist technicians who respond to a trouble condition.
- D. Graphic Annunciator (GA) – Used to provide information regarding the status of detection, sprinkler and supervisor devices by zone and or floor of the building.

1.6 Submittals

- A. Submittals shall address interface with other significant electrical subsystems (e.g. electrically controlled smoke dampers, door holders, smoke evacuation and smoke control systems, security lock door hardware, etc.).
- B. Shop Drawings:
 - 1. The fire alarm contractor shall submit complete Shop Drawings to the engineer for review, prior to performing any work. They shall clearly demonstrate compliance with the engineer's plans and specifications, which have a System Response Matrix showing the fire alarm system's actions (outputs) required for each type of alarm, supervisory, and trouble signal. Any non-compliant features must be fully described. Shop drawing submittals shall provide mA draw for each device submitted and the listed minimum voltage required to operate. Panel submittal shall list voltage drop allowed for panel and for individual NAC circuits.
 - 2. The submitted shop drawings shall show equipment, device identification numbers and locations, and connecting wiring of entire fire alarm system. Include wiring and riser diagrams. Wiring diagrams shall be based on the project floor plans, with devices and proposed conduit routing. The conductor composition for each conduit section shall be provided. The distance and route for each NAC (Notification Appliance Circuit) shall be shown. Riser diagrams

shall show consecutive connections for all devices with addresses and candela and Candela ratings.

3. Engineer's approval (with or without corrections) of contractor's Shop Drawings, samples, cut sheets, etc., is for general conformance with the contract documents and design concept. It shall not relieve the contractor of responsibility for full compliance with the project plans and specifications, EXCEPT for any specific non-compliant features for which the engineer gives written authorization.
4. Installation Instructions: The contractor shall submit to the engineer of record the Manufacturer's detailed installation instruction for the Fire Alarm Control Panel and all duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.
5. Battery and Voltage Drop Calculations:
 - a. Include a copy of system battery sizing calculations with the shop drawing submittal to the engineer. Use manufacturer's battery discharge curve to determine expected battery voltage after 60 hours of providing standby power. Then use calculated Notification Appliance Circuit current draw in the alarm mode to determine expected voltage drop at End of the Line Resistor (EOL), based on conductor resistance per conductor manufacturer's data sheet or NEC.
 - b. Fire Alarm Vendor's calculations must be submitted with the shop drawings, and prior to installation of equipment. (Buildings without generators require minimum 60 hours of battery backup to cover the weekends and major power outages. Buildings with generators require minimum 24-hour battery backup.) In the submittal package identify Notification Appliance Circuits (NAC) current draws and voltage drops for each circuit. Vendor must utilize the "end offline" method for voltage drop calculations. The "mid-point" method is not acceptable. In no case shall the calculated voltage at any notification appliance fall below the minimum listed operating voltage for the devices used.
 - c. The voltage drop at EOL must not exceed 14% of the expected battery voltage, after the required standby time plus alarm time. (Typically, for a 24-volt system, this limits the voltage drop from the battery to the EOL to 3 volts). Determine "worst case" voltage at far end of each NAC, by subtracting its calculated V-drop from the expected battery voltage. The result must be no less than the minimum listed operating voltage for the alarm notification appliances used. All these calculations must be placed on a dedicated sheet of as-built drawings, for future reference by fire alarm service technicians.
 - d. Provide copies of battery and voltage drop calculations at final inspection.
6. Maintenance Data: The contractor shall submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual.

7. Maintenance Contract: The contractor shall submit a quote for a maintenance contract to provide all maintenance, test, and repair described below and/or in accordance with NFPA-72, "Guide for Testing Protection Signaling Systems". Include also a quote for unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of two (2) years after expiration of the guaranty. Maintenance and testing shall be on a semiannual basis or as required whichever is the most restrictive. A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventive maintenance. The schedule shall include:
 - a. Inspection and testing of the fire alarm system in accordance with the requirements of NFPA 72 Chapter 14
8. Certifications:
 - a. Submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses, and telephone numbers in the certification.
 - b. Installer's training certificate as defined under Quality Assurance

PART 2 - PRODUCTS

- 2.1 FIRE ALARM CONTROL PANEL (FACP) and SPRINKLER ALARM CONTROL PANEL (SACP)
 - A. FACP and SACP- General: The FACP and SACP shall meet the following general requirements (unless otherwise required by the owner for certain systems).
 1. The system is to be the addressable type, with a 24vdc nominal operating voltage.
 2. The system is to have multiple access levels, so owner's authorized personnel can disable individual alarm inputs or normal system responses (outputs) for alarms, without changing the system's executive programming or affecting operation of the rest of the system. The process on how to do this must be included in the training required to be given to the owner's designated personnel and must also be part of the written documentation provided by the fire alarm equipment supplier.
 3. Signal Line Circuits: (SLC) also called addressable loop - Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Style 6 (Class A) Signaling Line Circuit (SLC) with no "T" taps.

4. Initiation Device Circuits: Initiation Device Circuits (IDC) shall be wired Class B. See NFPA 72 for definition of Initiating Device Circuit.
 5. Notification Appliance Circuits: Notification appliance circuits shall be wired Class B.
 6. Digitized electronic signals shall employ check digits or multiple polling. In general, a single ground or open on any system signaling line circuit shall not cause system malfunction, loss of operating power, or the ability to report an alarm.
 7. Loss of Power: Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
 8. The FACP must have an Alarm Silence switch and be equipped with the Subsequent Alarm (alarm resound) feature. Any remote annunciators or graphic displays located away from the alarm area must also include an audible signal with alarm resound feature.
- B. System Response to an Alarm Condition: When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
1. The system alarm LED shall flash.
 2. A local piezo-electric signal in the control panel shall sound.
 3. An 80-character minimum LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 4. On systems equipped with a printer, printing and history storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
 5. All system output programs assigned via control-by-event equations activating a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated. Exact programming shall be provided by the Contractor to meet the Owner's requirements.
 6. Detect activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
 7. Activate all fire alarm Notification Appliances in the building, sounding and flashing in synchronization continuously until the initiating device and control unit have been reset to normal condition.
 8. Activate digital alarm communicator.

9. Deactivate door hold control relay such that all smoke doors close.
 10. Deactivate control relays so that HVAC units shut down. Exception is for hazardous exhaust systems and smoke control.
 11. Activate elevator recall sequence if smoke is detected in any elevator lobby, shaft, or in the elevator equipment room.
 12. Activate control relay(s) to release all magnetically locked egress doors.
- C. System Response to a Trouble Condition:
1. Systems AC power trouble signal shall not be sent unless maintained for 1 to 3 hours (or more) Provide additional relays as required for this purpose.
 2. Provide immediate transmission of all other supervising signals.
 3. Provide adjustable time delay for all other trouble signals prior to transmission.
 4. FACP - Minimum Requirements: The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU and its associated equipment shall be protected so it cannot be affected by voltage surges or line transients consistent with UL standard 864. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system-controlled devices. The main FACP shall perform the following functions:
 5. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
 6. Supervise all initiating, signaling, and notification circuits throughout the facility by way of connection to monitor and control modules, or end of line resistor.
 7. Visually and audibly annunciate any trouble, supervisory or alarm condition on operator's terminals, panel display, and annunciators.
- D. System Capacity and General Operation: SCO approved system design shall have the following capacities and general operation modes:
1. The FACP shall provide or be capable of expansion to 198 intelligent/addressable devices per Signaling Line Circuits (SLC) and 1980 initiating points, minimum, per system. The number of SLCs provided shall be as indicated on the Drawings. Total points shall be as indicated on the drawings or otherwise specified with minimum 20% spare capacity.
 2. The FACP shall include a full featured operator interface control and annunciation panel that shall include a backlit, 80 minimum character liquid crystal display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.

3. All programming or editing of the existing program in the system shall be achieved with a personal computer on site. A copy of the database shall be left in the Document Box per NFPA 72.
 4. Notification Appliance Circuits with 20% spare capacity.
- E. The FACP shall be able to provide the following features:
1. Upload/Download to PC Computer
 2. Charger Rate Control
 3. Drift Compensation
 4. Automatic Day/Night Sensitivity Adjust
 5. Device Blink Control
 6. Pre-alarm Control Panel Indication
 7. Trouble Reminder
 8. NFPA 72 Smoke Detector Sensitivity Test
 9. System Status Reports
 10. Periodic Detector Test
 11. Alarm Verification, by device, with tally
 12. Non-Alarm Module Reporting
 13. Block Acknowledge
 14. Smoke Detector Maintenance Alert
 15. Control-By-Time
- F. The control panel shall be capable of printing historical data and device parameters and shall include all equipment necessary to produce printouts, including an external printer and shall be listed as meeting the NFPA 72 sensitivity testing and maintenance requirements without the need for manually removing and testing each smoke detector. The control panel shall provide a display and a printed list of these sensitivity measurements as a permanent record of the required sensitivity testing. The system shall also annunciate a trouble condition when any smoke detector approaches 80% of its alarm threshold due to gradual contamination, with an annunciation of the location of the smoke detector requiring service. If any specialized equipment must be used to program any function of the smoke detector devices, then one must be furnished as part of the system.

- G. The system shall perform time-based control functions including automatic changes of specified smoke detector sensitivity settings.
- H. Central Processing Unit: The Central Processing Unit (CPU) shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the CPU.
 - 1. The CPU shall contain and execute all control-by-event (including ANDing, ORing, NOTing, CROSSZONEing) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory and shall not be lost with system primary and secondary power failure. The CPU shall also provide a real-time clock for time annotation of all system displays. The Time-of-Day and date shall not be lost if system primary and secondary power supplies fail.
 - 2. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
- I. Operators Control: Provide an operator's interface which allows the following minimum functions. In addition, the operator's interface shall support any other functions required for system control and/or operation:
 - 1. Acknowledge (ACK/STEP) Switch
 - 2. Signal Silence Switch
 - 3. System Reset Switch
 - 4. System Test Switch
 - 5. Lamp Test Switch
 - 6. Programmable, supervised switches for fire safety function bypasses. i.e. NAC Bypass, Elevator Capture Bypass, HVAC Shutdown Defeat, Smoke Control Bypass, etc. Switch operation shall be password protected.
- J. Display: The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
 - 1. The system display shall provide an 80 minimum -character back-lit alphanumeric Liquid Crystal Display (LCD).
 - 2. The Display shall also provide four Light-Emitting-Diodes (LEDs), which will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, and SIGNAL SILENCE.

3. The system display shall provide a touch keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be accessible through the display interface assembly to prevent unauthorized system control or programming.
- K. Signaling Line Circuit (SLC) Interface Board: The FACP shall contain SLC interface boards as required to communicate with the SLC. Each SLC board shall monitor and control a minimum of 198 intelligent addressable devices. This includes 99 analog detectors (Ionization, Photoelectric, or Thermal) and 99 monitor or control modules.
1. Each SLC interface board shall contain its own microprocessor and shall be capable of operating in a local mode (any SLC input activates all or specific SLC outputs) in the event of a failure in the main CPU of the control panel. The SLC interface board shall not require any jumper cuts or address switch settings to initialize SLC Loop operations. SLC interface boards shall provide power and communicate with all intelligent addressable detectors and modules connected to its SLC Loop on a single pair of wires. This SLC Loop shall be capable of operation as NFPA 72 Class A (Style 6) or Class X (Style 7).
 2. Each SLC interface board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that specific detector. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
- L. Printer: Provide a printer to provide hard-copy printout of all changes in status of the system. The printer shall timestamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. Thermal printers are not acceptable. The printer shall operate from a 120 VAC, 60 Hz power source. Provide table and stand for printer if it is to remain constantly connected to the fire alarm panel.
- 2.2 Remote Transmissions: The FACP shall be interfaced to a Digital Alarm Communications Transmitter (DACT). See requirements in NFPA 72, 26.6 for acceptable means to transmit fire alarm signals.
- M. Power Supply: The FACP power supplies shall operate on 120 VAC, 60 Hz and shall have a continuous rating adequate to power all equipment and functions in full alarm continuously. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line-to-ground, without damage. Further, the power supply shall be expandable for additional notification appliance power in 3.0 Ampere increments.

- N. The power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge.
- O. Batteries: Shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as required by the FACP and related equipment. Battery shall have enough capacity to power the fire alarm system for not less than 24 hours plus 5 minutes of alarm upon a normal AC power failure. NAC circuits shall not exceed 75% of maximum current load allowed. (For batteries serving emergency voice communications the duration of alarm reserve shall be 15 minutes in lieu of 5 minutes)
- P. Enclosures: The FACP shall be housed in a 3rd party listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable).

2.3 ALARM APPLIANCES

- A. Programmable Electronic Sounders: Sounders located outdoors shall be listed for use in wet locations. Electric sounders shall operate with synchronized audible output and have the following specifications:
 - 1. Voltage: Programmable electronic sounders shall operate on 24 VDC nominal.
 - 2. Programming: Electronic Sounders shall provide the ANSI S3.41 three-pulse temporal pattern audible evacuation signal, described in NFPA 72, with an output sound level of at least 90 dBA measured at 10 feet from the device. Output sound level shall be 110 dB maximum. Electronic Sounders shall be field programmable without the use of special tools.
- B. Strobe Lights shall be located as shown on the Drawings. Strobe lights indicated for use exterior to the building shall be mounted at the indicated elevation and listed for use in wet locations. Strobe lights shall operate with synchronized flash output and have the following specifications:
 - 1. Voltage: Strobe lights shall operate on 24 VDC nominal.
 - 2. Maximum pulse duration: 2/10ths of one second.
 - 3. Strobe intensity and flash rate: Must meet minimum requirements of UL 1971. Provide strobe lights with minimum intensity Candela (Cd) rating of 15 Cd, or greater if such is indicated adjacent to the device symbol on the Drawings. The Fire Alarm Contractor shall verify all candela settings prior to conducting the voltage drop testing required later in this document. Contractor shall also verify the design candela settings are adequate for the space being covered. Care must be taken to assure the devices are mounted in the exact locations shown on the approved shop drawing documents. Notify the designer of any deficiencies.

- C. Horns: Where provided, shall provide a sound level of 15 dBA above ambient as listed in the NFPA 72.
- D. Audible/Visual Combination Devices shall comply with all applicable requirements for both Programmable Electronic Sounders and Strobe Lights.
- E. Bells shall be 10" diameter vibrating type located as shown on the Drawings; bells located outdoors shall be listed for use in wet locations. Bells shall have the following specifications: Voltage: Bells shall operate on 24 VDC nominal.

2.4 INITIATING DEVICES

- A. Addressable Devices - General: All initiating devices shall be individually addressable. Addressable devices shall comply with the following requirements:
 - 1. All addressable spot type and duct smoke detectors shall be the analog type and the alarm system shall automatically compensate for detector sensitivity changes due to ambient conditions and dust build-up within detectors. This feature must be armed, and sensitivities set prior to acceptance of the system.
 - 2. Address Setting: Addressable devices shall provide an address-setting means.
 - 3. Connections: Addressable devices shall be connected to a Signaling Line Circuit (SLC) with minimum two (2) wires.
 - 4. Operational Indications: Addressable smoke and heat detectors shall provide dual LEDs. LEDs shall flash under normal conditions, indicating that the device is operational and in regular communication with the control panel. The flashing mode operation of the detector LEDs shall be optional through the system field program.
 - 5. Intelligent Initiation Devices: All smoke detectors shall be the "intelligent" in that smoke detector sensitivity shall be set through the FACP and shall be adjustable in the field through the field programming of the system. Sensitivity shall be capable of being automatically adjusted by the FACP on a time-of-day basis. Using software in the FACP, detectors shall be capable of automatically compensating for dust accumulation and other slow environmental changes that may affect performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
 - 6. Spot-type detectors must be the plug-in type, with a separate base (not a mounting ring), to facilitate their replacement and maintenance. The base shall have integral terminal strips for circuit connections, rather than wire pigtails.
 - 7. Device mounting Base: Unless otherwise specified all detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.
 - 8. Test Means: The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test

may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel when in the "test" condition. Actual or synthetic smoke must be used during the 100% testing to assure smoke entry into the sensing chamber.

9. Device Identification: Detectors shall store an internal identifying type code that the control panel shall use to identify the type of device.
- B. Photoelectric Smoke Detectors: Photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- C. Thermal Detectors: Thermal Detectors shall be intelligent addressable devices rated at 135°F (58°C) and shall have a rate-of-rise element rated at 15° F. (9.4°C) per minute. It shall connect via minimum two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop. Thermal detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
 1. Non-Rate of Rise Detectors: Provide thermal detectors with non-rate of rise thermal elements. Non-rate of rise detectors is indicated by NRR adjacent to the thermal detector symbol. Where used in elevator machine rooms or hoist ways, select temperature rating nominal 10 degrees F less than the adjacent fire sprinkler.
 2. Specialized Element Temperature Ratings: Provide thermal detectors with specialized element temperature ratings. Specialized element temperatures are indicated by a temperature rating adjacent to the thermal detector symbol, e.g. 195°F.
- D. Multi-sensor Detectors: Detectors employ two or more of the above detection types with integrated operating principals, mounted in a single housing. The outputs of the analog sensors shall be transformed into digital signals that are combined and processed by special algorithms. The computations shall be designed to discriminate between normal ambient changes in a building and those changes associated with a fire. //Provide photoelectric smoke detection and rate of rise thermal detection. //Provide photoelectric smoke detection, ionization smoke detection and rate of rise thermal detection. //
- E. Duct Smoke Detector: In-Duct Smoke Detector Housings shall accommodate a velocity rated photoelectric detector. The device, independent of the type used, shall provide continuous analog monitoring and alarm verification from the panel. When enough smoke is sensed, a supervisory or alarm signal shall be initiated at the FACP. Coordinate with owner for response appropriate for the location.
- F. Addressable Pull Stations - General: Addressable pull stations shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock and shall be designed so that after actual

emergency operation, they cannot be restored to normal use except using a key. All pull stations shall be dual action, have a positive, visual indication of operation and utilize a key type reset. The Glass-break rods are not allowed. Mount pull station with operating mechanism between 42-inches and 48-inches above finished floor.

2.5 MISCELLANEOUS SYSTEM ITEMS

- A. Addressable Dry Contact Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised zone (either Style D or Style B) of non-addressable Alarm Initiating Devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.
 - 1. Indication of Operation: An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
 - 2. Supervision: Unless specifically noted otherwise on the drawings provide one monitor module for each sprinkler switch.
- B. Two Wire Detector Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone, // Class A // B (Style D or Style B operation) //of nonaddressable 2- wire smoke detectors or alarm initiating devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings. Indication of Operation: Unless otherwise indicated on the Drawings an LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
- C. Addressable Control Module: Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual (A/V) Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. The control module shall provide address-setting means. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel. If the voltage being controlled is 120 VAC or greater, an isolating 24 VDC relay shall be used.
 - 1. Configuration: The control module NAC circuit may be wired for // Style Z // Style Y // (Class A/B) // with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires. Designer shall confirm the relay contacts are rated for the attached load.

2. Power Source: Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, 3rd party listed remote power supply. A/V power sources and connections are not shown on the Drawings.
- D. Isolator Module: Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop to 20 addressable devices. Modules must be readily accessible (not above ceiling) and clearly labeled.
1. Operation: Isolator Modules shall operate such that if a wire-to-wire short occurs, the Isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section. The Isolator Module's operations shall be totally automatic.
 2. The Isolator Modules shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- E. Water Flow Switch: Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve as required per NFPA 13. Installation: Water Flow Switches shall be connected by the Division 16 (Electrical) Contractor but furnished and installed by the Division 23 (Mechanical) Contractor.
- F. Sprinkler and Standpipe Valve Supervisory Switch: Supervisory switch mechanisms shall be contained in a weatherproof housing that shall provide a 3/4-inch tapped conduit entrance and shall incorporate the necessary facilities for attachment to the valves. Switch housing shall be finished in red baked enamel. Mounting: Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
- G. Serially Connected Remote Annunciator: Annunciator shall communicate with the fire alarm control panel via an EIA-485 communications loop (four-wire) and shall individually annunciate all zones in the system. System zones shall be as indicated on the Drawings. Up to 10 annunciators may be connected to the EIA-485 communications loop.
1. Annunciator Indicators: The annunciator shall provide a red Alarm LED per zone, and a yellow Trouble LED per zone. The annunciator shall also have an "ON-LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels. Annunciator switches may be used for System

control such as, Global Acknowledge, Global Signal Silence, and Global System Reset. All annunciator switches and indicators shall be software programmable.

2. LCD Alphanumeric Display Annunciator: The Alphanumeric Display Annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text. The LCD Annunciator shall display all alarms and trouble conditions in the system.
 3. System Capacity: The system shall allow a minimum of four LCD annunciators. In addition to annunciation functions, each LCD annunciator shall be capable of the following software programmed system functions: Acknowledge, Signal Silence and Reset.
 4. Connections: The annunciator shall connect to a two-wire EIA-485 interface. The two-wire connection shall be capable operation at distances of 6,000 feet. Provide interface to fiber optic cable systems and/or repeater units where such are indicated on the Drawings.
- H. Remote Annunciator Indicator Lights (RAIL): RAILs shall be provided with a key type switch for testing of the annunciated device. In addition. RAILs shall have the following features: Voltage: RAILs shall operate on 24 VDC nominal.
- I. Battery Power Supply (BPS) &/or Supplementary Notification Appliance Circuit (SNAC): These types of panels shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as required by the FACP and related equipment. Battery shall have enough capacity to power the fire alarm system for not less than //24 // 60 // hours plus // 5 // 15 // minutes of alarm upon a normal AC power failure. Battery cabinet shall be twice the size of the batteries it will contain. NAC circuits shall not exceed 75% of maximum current load allowed.
- J. Surge Protection: The following protection against voltage transients and surges must be provided by the fire alarm equipment supplier, and installed by the electrical contractor:
1. On AC Input: A feed-through (not shunt-type) branch circuit transient suppressor such as Leviton 51020-WM-DIN, or Ditek DTK-120SRD 20 Amp or equivalent UL 1449 - Latest Edition Listed device.
 2. On DC Circuits Extending Outside Building: At a point near entry to the building provide "pi"-type filter on each leg, consisting of a primary arrestor, series impedance, and a fast-acting secondary arrestor that clamps at 30v-40v.
 3. Some acceptable models: Simplex 2081-9027, Simplex 2081-9028, Transtector TSP8601, Ditek DTK 2MHLP24BWB series, Citel America B280-24V, and Northern Technologies DLP-42. Submit data on others to the engineer for

approval. UL 497B listing is normally a prerequisite for their consideration. Devices using only MOV active elements are not acceptable.

2.6 Wiring

- A. Addressable loop (signaling line) circuits shall be wired with type FPL/FPLR/FPLP fire alarm cable, AWG 18 minimum, low capacitance, twisted shielded copper pair. Cable shield drain wires are to be connected at each device on the loop to maintain continuity, taped to insulate from ground, and terminated at the FACP. Acceptable cables include Atlas 228-18-1-1STP, BSCC S1802s19 (same as EEC 7806LC), West Penn D975, D991 (AWG 16), D995 (AWG 14), or equal wire having capacitance of 30pf/ft. maximum between conductors. Belden 5320FJ acceptable if only FPL rating needed. The cable jacket color shall be red, with red (+) and black (-) conductor insulation.
 - 1. Unshielded cable, otherwise equal to the above, is permitted to be used if the manufacturer's installation manual requires, or states preference for, unshielded cable.
 - 2. In underground conduit, use Type TC or PLTC cable (PE insulated) to avoid problems from moisture.

PART 3 - EXECUTION

3.1 FIRE ALARM SYSTEM:

- A. The fire alarm system shall be new and furnished with a warranty (parts & labor) of at least one year from the date of beneficial occupancy or final inspection by SCO and Owner. Equipment, initiating devices, and alarm appliances shall be arranged, and the annunciator zones shall be configured as described by the engineer's written specifications.
- B. All equipment supplied must be specifically listed for its intended use and shall be installed in accordance with the manufacture's recommendations. The contractor shall consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Contractor shall refer to the Riser/Connection diagram for all specific system installation/termination/wiring data.
- C. Do not locate addressable modules in unconditioned spaces.
- D. All system components shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Adhesives are not permitted to mount fire alarm system components to building surfaces or structure. See Symbol sheet.
- E. When programming the system, activate the automatic drift compensation feature for all spot type smoke detectors. Systems with alarm verification are not to have this feature activated without written direction from the owner's representative or the AHJ. Alarm verification must not be used with multi-sensor/multi-criteria detectors under any circumstances, as inadequate system response may result.

- F. Set spot-type smoke detector sensitivities to normal/medium, unless directed otherwise by the design engineer/owner's rep.
- G. Print a complete System Status and Programming Report after the above steps have been done. This must include the program settings for each alarm initiating device and the current sensitivity of each analog addressable smoke detector. This documentation shall be provided at the SCO inspection.

3.2 FIRE ALARM CONTROL EQUIPMENT INSTALLATION

- A. The technician who makes final connections and programs the FACP is the "installer" even though most field connections to system devices and appliances are normally made by electrical contractor personnel. The responsibility for assuring a proper installation overall rests with this individual fire alarm system technician. In addition to doing the final hookups and activating the system, this individual is expected to check the field connections to assure all work is properly done. The absence of system "trouble" signals is not an adequate measure of the field wiring, which could have "T" taps, the wrong type of wire, improper terminations, ground (drain wire) issues, etc.
- B. Notification Appliance Circuit booster power supplies must be individually monitored by the FACP and protected by a smoke detector per NFPA 72. They shall not be located above a ceiling, or in non- conditioned space. A 24vdc power circuit serving addressable control relays must also be monitored for integrity. All fire alarm power supplies shall have 120-volts surge suppressors.
- C. Basic operating instructions shall be framed and permanently mounted at the FACP. (If the owner concurs, they may instead be affixed to the inside of the FACP's door.) In addition, the NFPA 72 "Record of Completion" must either be kept at the FACP, or its location shall be permanently indicated there by an engraved label. All System documentation shall be provided and housed in a Documentation Cabinet at the control panel or other approved location. (Per 2013 NFPA 72: 7.7.2)
- D. Provide an engraved label on outside of the FACP door identifying its 120-vac power source, as follows: Panelboard location, panelboard identification, and branch circuit number. On inside of FACP door, indicate panelboard location.
- E. Alarm notification appliances (audible and visible) are to comply with NFPA 72, the North Carolina Building Code, and ANSI 117 criteria for intensity and placement. The standard audible evacuation signal is the ANSI S3.41 three-pulse temporal pattern. All strobe lights installed in a single space must be synchronized. Devices can be mounted on the ceiling. Wall mounted devices shall be mounted with the entire lens between 80" minimum and 96" maximum off finished floor. See the NFPA 72 for additional alarm notification appliance requirements for special situations.

3.3 SURGE PROTECTION

- A. For each AC power circuit that interfaces with fire alarm equipment, install an AC suppressor in a listed enclosure near the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil to be 5 to 10 turns, about 1" diameter, and securely tie-wrapped. This series impedance will improve the effectiveness of the suppressor in clipping fast rise time voltage transients.

- B. On DC Circuits Extending Outside Building: Install the surge arrestor in a labeled enclosure near the point of entry to or exit from each building.

3.4 SIGNALING LINE CIRCUITS

- A. One loop per floor for signaling-line circuits. Outgoing and return loops must be in separate raceways per 2013 NFPA 72. (12.3.7) Provide isolation modules (or isolator bases) along each SLC (addressable loop). 20 devices max between ISO's.

3.5 AC POWER

- A. Systems are to be provided with a separate and independent source of emergency power. Switching to emergency power during alarm shall not cause signal drop-out. Batteries must meet the appropriate NFPA capacity requirements, with a 25% safety factor. This requirement is in effect even if generator power is supplied to the Fire Alarm Control Panel.
- B. The branch circuit breaker(s) supplying the system must be physically protected by a breaker handle lock-on device and each must be identified with a 1/4" permanent red dot applied to handle or exposed body area.
- C. Provide an engraved label at each fire alarm system control unit, system sub-panel or data gathering panel, supplementary notification appliance (SNAC) panel, digital alarm communicator, etc. identifying the panel location, panel name, and breaker number for the 120VAC circuit. Example:

Electrical Rm 120

Panel EP1, Circuit 22

- D. The fire alarm system shall monitor 120-VAC power to shunt trip breakers used in conjunction with fire suppression systems. Examples include a shunt trip used for cooking appliance power shut-off when the kitchen hood fire suppression system shoots, or primary elevator power shut-down upon heat detector activation in sprinkled hoist ways or machine rooms. Use an addressable monitor module to accomplish this supervisory function. Provide a breaker handle lock-on device on circuits used for shunt trip power.

3.6 CONDUIT AND WIRING

- A. The exterior of all junction boxes containing fire alarm conductors shall be painted red; box interiors shall not be painted. Box covers for junction boxes containing fire alarm conductors shall be painted red on both sides.
- B. Box covers shall be labeled to indicate the circuit(s) or function of the conductors contained therein. Labels shall be neatly applied black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.
- C. All fire alarm system wiring shall be in metal conduit or surface metal raceway. All fire alarm system raceway, couplers, and connectors must meet the performance and installation requirements of Electrical Specification Section "RACEWAYS".

1. Cable size and the requirement to maintain a Class "A" or Class "X" loop on all Signaling Line Circuits cause conduit fill to exceed specified maximums for the 1/2" size; therefore, 3/4" raceway should be used.
 2. PVC conduit is permitted to be used underground, in concrete, and in locations approved by the AHJ.
- D. All conduits that penetrate outside walls from air-conditioned space must have internal sealing (duct- seal), to prevent condensation from infiltrating humid air.
- E. All wiring shall be color coded. All the circuits in the system shall be wired with AWG 14, minimum, stranded copper, THHN/THWN conductor, installed in metallic conduits. Color Coded wires shall be in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:
1. Initiating Circuits, General ----- Red (+)/White (-)
 2. Initiating Circuits, Smoke Only ----- Violet (+)/Gray (-)
 3. Signal Line Circuit cable ----- Red jacket with Red (+)/Black (-)
 4. Alarm Indicating Appliance Circuits ----- Blue (+)/Black (-)
 5. AHU Shutdown Circuits ----- Yellow (+)/Brown (-)
 6. Door Control Circuits ----- Orange
 7. Elevator Capture Circuits ----- Brown
- F. To minimize wiring fault impact, isolation modules shall be provided in all the locations listed below. If ceiling height ≤ 10 feet, isolator base type initiating devices are permitted to be used to satisfy any or all the following
1. In or immediately adjacent to the FACP, at each end of the addressable loop. These two isolators must be in the same room and within 15 feet of the FACP.
 2. After each 20 initiating devices and control points on the addressable loop, or a lesser number where recommended by the manufacturer. (Check instructions.)
 3. For loops with less than 20 devices and control points, install an isolator at the approximate middle of the loop (in addition to those at the FACP).
 4. Near the point any addressable circuit extends outside the building, except for those attached to the building exterior walls and well sheltered by walkways.
 5. For loops covering more than one floor, install isolator at terminal cabinet on each floor (with additional isolator[s] on any floor with over 20 addresses).
 6. Each isolation module must be clearly labeled, readily accessible for convenient inspection (not above a lay-in ceiling), and shown on as-built drawings
- G. Detection or alarm circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP, any 120 VAC control wiring or other circuits with an externally supplied AC/DC voltage above the nominal 24 VDC system power must

be properly separated by a minimum of .25 inches per NEC, from other circuits, and the enclosure must have an appropriate warning label, to alert service personnel to the potential hazard. See NEC 760.136.

- H. Class A or X Circuits Required: Systems with one or more addressable sub-panels that (1) have an integral addressable loop controller, or (2) monitor multiple non-addressable initiation zones, shall comply with the NFPA 72 requirements for Class "A" or "X" circuits for their networking cables.
- I. There shall be no splices in the system other than at device terminal blocks, or on terminal blocks in cabinets. "Wire nuts" and crimp splices will not be permitted. Permanent wire markers shall be used to identify all connections at the FACP and other control equipment, at power supplies, and in terminal cabinets. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
- J. In multistory buildings, all circuits leaving the riser on each floor shall feed through a labeled terminal block in a hinged enclosure accessible from the floor. If building layout requires the terminal cabinet to be above a drop ceiling, its location must be clearly and permanently identified with a placard readable from floor. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
- K. All wiring shall be checked for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be ten (10) megohms, as verified with an insulation tester. Provide advanced notice to the Engineer of record of these tests.
- L. The system shall be electrically supervised for open or (+/-) ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug-in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.

3.7 ADDRESSABLE PULL STATIONS

- A. Addressable pull stations shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except using a key. All pull stations shall be dual action, have a positive, visual indication of operation and utilize a key type reset. Glass-break rods are not allowed. Mount pull station with operating mechanism between 42-inches and 48-inches above finished floor.

3.8 NOTIFICATION DEVICES

- A. Both audible and visible alarm signals shall be provided. Visible signals for fire alarm must be the strobe (flash discharge) type, with white or clear lens, and shall comply with current ADA requirements for intensity and placement.
- B. Alarm notification appliance (NAC) circuits shall be NFPA 72 Class "A" or Class "B". The load connected to each circuit must not exceed 80% of rated module output. The NAC voltage drop during alarm must not exceed 14% of the voltage measured across the batteries at that time. To achieve this, the design must consider wire size, length of circuit, device load, inherent voltage loss within the FACP power supply, etc. The

contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly.

- C. The location of all end of line devices shall be labeled on the device, with NAC panel number and NAC circuit number, and recorded on the "As-built" drawings. EOL shall not be located more than 12-feet above finished floor.

3.9 DETECTORS

- A. The FACP and all other control equipment locations, including any transponders, sub-panels, and booster power supplies, must be protected by a spot type smoke detector located within 15 feet of the equipment (measured horizontally).
- B. When installed in a room, detectors shall be oriented, so their alarm light is visible from the nearest door to the corridor, unless Remote Alarm Indicator Light (RAIL) equipped.
- C. Spot-type smoke detectors shall secure the head to the base thru the built-in locking device. For detector mounted within 12 feet of the floor, activate this lock after the system has been inspected and given final acceptance.
- D. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors must be replaced by the contractor at no additional cost to the Owner. Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and must not be used for that purpose. They are suitable only during final, minor cleanup or touchup operations.
- E. A detector installed where accidental damage or deliberate abuse is expected shall be provided with a guard that is listed for use with it and is acceptable to the AHJ.
- F. Identification of individual detectors is required. Assign each a unique number as follows, in sequence starting at the FACP: (Addressable Loop # -- Device #) Show on the as-built plans, and permanently mount on each detector's base so that it's readable standing on the floor below without having to remove the smoke detector. Exception: For detectors with housings (i.e., air duct, projected beam, air sampling, flame), apply the identification to a suitable location on exterior of their housing. Device labels may not be affixed to the device. Identification labels must be printed labels with black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.
- G. Addressable Interface Modules (control and monitor modules)
 - 1. Addressable interface modules (used to monitor all contact type initiating devices) must be in a conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location.
 - 2. One module may serve as many as 6 heat detectors, in a single space.

3.10 DUCT MOUNTED SMOKE DETECTORS

- A. All air duct/plenum detectors must have a Remote Alarm Indicator Lamp with test switch (RAILS) installed in the nearest corridor or public area and identified by an engraved label affixed to the wall or ceiling. Duct smoke detectors are permitted to be installed only inside an air duct. It is not appropriate to mount them in front of a return air opening. Duct detectors shall also be installed in a manner that provides suitable, convenient access for required periodic cleaning and calibration. The numbers of detectors per duct shall be per NFPA 72 requirements based on the size of the air duct, air duct configuration, air speed, and duct manufacture's installation requirements.
- B. Each duct detector installation shall have a hinged or latched duct access panel, 12x12 inches minimum, for sampling tube inspection and cleaning. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.
- C. Duct detector sampling tubes shall extend the full width of the duct. Those over 36 inches long must be provided with far end support for stability.
 - 1. The preferred method for providing support is to extend the intake tube through the far side of the duct, seal around the tube where it penetrates the duct wall and plug the end with a rubber stopper. This facilitates visual inspection and intake tube cleaning.
- D. Duct smoke detector mounting position and air sampling tube orientation, are critical for proper operation. The Manufacturer's detailed installation instructions must be followed. The contractor shall mark the direction of air flow on the duct at each duct detector location.
- E. Avoid the use of duct detectors on outside air intakes, as this can lead to nuisance alarms and troubles from moisture and dust.
- F. A fire alarm panel output for a duct detector signal shall be as required by NC Building Codes and NFPA 72.

3.11 AIR HANDLER UNIT (AHU) SHUTDOWN

- A. A supervised "AHU Shutdown Defeat" switch must be provided in/adjacent to the FACP or as a key- operated function in the Remote Annunciator (if provided). If the FAA option is utilized, provide an informative engraved label at the FACP about this function. The switch must cause a system "trouble" indication when it's placed in the off-normal ("Shutdown Defeated") position. This is to provide the owner with a convenient means to temporarily resume HVAC operation in the event an unwanted alarm will not clear, prior to arrival of the fire alarm service technician, or for testing purposes.
- B. If the building has smoke control system fans (pressurization or exhaust), or smoke purge fans, provide Hand-Auto-Off switches at an approved location. They must be clearly labeled, and FACP - monitored or provided with status indicator lights. This is often provided by the controls contractor, rather than the fire alarm contractor, and does not need to be part of the fire alarm system. Responsibility should be clearly indicated in the project specification. For three-position toggle switches we recommend this intuitive arrangement: Hand (Manual Run) to be "up" and have an amber LED; Auto to be center position with a green LED; Off to be down and have a red LED.

- C. All shutdown relays must be directly controlled and monitored by the fire alarm system. The Building Automation System (BAS) shall not be used for life safety functions unless the BAS is supervised by the Fire Alarm System for off normal conditions. Relays should be wired fail safe. (BAS systems typically are not battery backed and typically do not supervise themselves or their wiring, for faults or communication loss between processors or CPU's.)
- D. Buildings with smoke control or smoke removal systems shall have the Fire Fighter's Smoke Control Panel monitored by the Fire Alarm System, for all trouble conditions.

3.12 REMOTE ALARM TRANSMISSION REQUIREMENTS

- A. Each system with automatic fire detection, or which monitors a sprinkler system, shall be equipped with a 4-channel (minimum) Digital Alarm Communicator Transmitter (DACT) for transmission of fire alarm, supervisory, and trouble signals to a Central Station, Remote Supervising Station, or Proprietary Supervising Station. DACT shall be dual transmission link type in accordance with NFPA 72. Transmission shall be cellular and VOIP. Provide back-up power for signal transmission equipment as required in NFPA 72.'
- B. The following signals shall be reported as applicable:
 - 1. Fire Alarm
 - 2. Sprinkler Water Flow Alarm
 - 3. Fire Pump Running Alarm (if pump provided) as a supervisory signal
 - 4. Fire Pump Abnormal Status Supervisory Signal
 - 5. Sprinkler Valve Tamper (Closed) Supervisory Signal
 - 6. Sprinkler Low Temperature / Air Pressure Supervisory Signal
 - 7. Burglary / Intrusion / Duress / Other Security or Emergency Alarm
 - 8. Fire Alarm System AC Power Trouble (only if 120vac interrupted for 1 to 8 hours)
- C. The precedence of DACT / signals transmitted to the Supervising Station shall be as follows:
 - 1. Fire Alarm
 - 2. Water Flow
 - 3. Supervisory Signal
 - 4. Trouble Signal*
- D. Do not confuse fire suppression system "supervisory" signals and fire alarm system "trouble" signals. These are completely different types of signals, annunciated and transmitted as separate and distinct events.

- E. The Contractor must provide a type of DACT that is compatible with the owner's alarm receiving equipment, or the Supervising Station selected by the owner, as applicable. He must also program the PROM, connect each DACT to the data line provided to him, and verify proper signal receipt by the Supervising Station. The transmission means shall comply with NFPA 72.

3.13 FIRE ALARM SYSTEM INSTALLATION AND CONFIGURATION

- A. Supervision required: The connection between individual addressable modules and their contact type initiating device(s) must be supervised.
- B. Graphic Chart must be mounted behind Plexiglas and secured to surface. Mounting shall be such that charts cannot be removed without the proper tools.
- C. Floor Plans with Device Numbers: A copy of the floor plans shall be provided in the Documentation Cabinet at the control panel. A separate sheet shall be provided for each floor. Plans shall be reduced in size from engineering plans in order to fit on 11 x 14 sheets. All device addresses shall be clearly labeled on plans. Indicate locations of all cabinets, modules and end of line device.
- D. Loop 1 shall be assigned to the lowest level devices and loop number shall increase with floor number. Device numbering starts in the same location on each floor and increase accordingly as circuit location increases.

3.14 SYSTEM DOCUMENTATION, TRAINING, AND MAINTENANCE

- A. Maintenance: The manufacturer, or authorized distributor, must maintain software version (VER) records on the system installed. The system software shall be upgraded free of any charge if a new VER is released during the warranty period. For new VER to correct operating problems, free upgrade shall apply during the entire life of the system.
- B. System Report In addition to the Shop Drawing submittal described elsewhere, the fire alarm system contractor shall provide the engineer two bound copies of the following technical information, for transmittal to the owner:
 - 1. As-Built wiring diagram showing all loop numbers and device addresses, plus terminal numbers where they connect to control equipment.
 - 2. As-built wiring and conduit layout diagrams, including wire color code and/or label numbers, and showing all interconnections in the system.
 - 3. Electronic circuit diagrams of all control panels, modules, annunciators, communications panels, etc.
 - 4. Manufacturer detailed maintenance requirement.
 - 5. Technical literature on all control equipment, isolation modules, power supplies, batteries, detectors, manual stations, alarm/supervisory signal initiating devices, alarm notification appliances, relays, remote alarm transmission means, etc.
 - 6. The as-built "calculations" sheet.

- C. Electronic archive: Complete configuration data (site-specific programming) for the system must be stored on electronic media and archived by the fire alarm system manufacturer or authorized distributor. A USB drive or CD copy of this data shall be submitted to the engineer for transmission to the owner on the day the system is commissioned. A copy of this site-specific data base shall also be placed in the Documentation Cabinet.
- D. The contractor shall provide the owner with one copy of the following:
 - 1. All software required for the installed fire alarm system.
 - 2. Complete documentation for all software for both the installed fire alarm system and for any interface PC software necessary for system functions as described above.
 - 3. Framed floor plans mounted at the FACP: Plans shall show all system devices with the unique device identification numbers indicated adjacent to each device. The identification numbers shall match those represented in the as-built drawings and those reported at the FACP and the LCD annunciator. As-built room numbers shall match the signage in the building.
 - 4. Interconnection cable where such is required to connect the fire alarm system to a PC; (if Owner does not have the needed PC to check the system).
- E. The manufacturer's authorized representative must instruct the owner's designated employees in operation of the system, and in all required periodic maintenance. A minimum of 8 hours on-site time will be allocated for this purpose and, for those facilities operating on a 24-hour basis (prisons, hospitals, etc.) one additional hour of instruction will be individually provided for the 2nd and 3rd shift. Two copies of a written, bound summary will be provided, for future reference.
 - 1. Some facilities maintain their own systems and require more in-depth training. Check to verify needs and requirements.
 - 2. Scheduling of training must be arranged to meet the Owner's schedule. Additional training shall be available at a cost to be mutually agreed upon by the Owner and the Contractor.
 - 3. Training shall be in the Owner's provided classroom.
 - 4. The training may not be waived, deleted or reduced in the number of hours required.
 - 5. Training shall cover as minimum the following topics:
 - a. Preventive maintenance service techniques and schedules, including historical data trending of alarm and trouble records.
 - b. Overall system concepts, capabilities, and functions. Training shall be in depth, so that the owner shall be able to take any device out of service and return any device to service without need of Manufacturer's approval or assistance.

- c. Explanation of all control functions, including training to program and operate the system software.
- d. Methods and means of troubleshooting and replacement of all field wiring devices.
- e. Methods and procedures for troubleshooting the main fire alarm control panel, including field peripheral devices as to programming, bussing systems, internal panel and unit wiring, circuitry and interconnections.
- f. Manuals, drawings, and technical documentation. Actual system software used for training shall be provided in digital form and shall be left with the Owner at the completion of training for the Owner's use in the future.
*Training Quote: Provide a quote for one of the owner's Employees to receive factory certification level training on the system being installed. Quote is to include travel, room and food allowance.

3.15 SPARE PARTS:

- A. The following spare parts shall be provided with the system. For multi-building projects, calculate quantities separately for each building that contains a dedicated fire alarm control panel. If FACP also serves auxiliary buildings (e.g., storage, boiler/chiller), calculate as if one building. Increase decimal quantities to the next higher whole number.

Fuses (If Used)	2 of each size in system
Manual Fire Alarm Boxes	2% of installed quantity
Addressable Control Relays	4% of installed quantity
Indoor Horns/Speakers with Strobes Lights	4% of installed quantity
Indoor Strobe-only Notification Appliances	4% of installed quantity
Monitor Modules (Addressable Interface)	4% of installed quantity
Isolation Modules / Isolation Bases	4% of installed quantity
Addressable, Electronic Heat Detectors	4% of installed quantity
Spot-Type Smoke Detectors / Sounder Bases	6% of installed quantity

No spares are required for projected beam, air sampling, or duct smoke detectors

3.16 SYSTEM TESTING & CERTIFICATION

- A. Upon completion of the installation the Contractor and the Manufacturer's authorized installer and designer together shall conduct a 100% performance test of every alarm initiating device for proper response. The system shall operate for 48 hours prior to start of test. The Contractor shall be present for the full 100% test. The person responsible for programming the system must be present.

- B. The A/E and owner must be given 7 days' notice of the tests. All Audio-Visual Device Testing shall be scheduled with the owner.
- C. 100% Test: The manufacturer or authorized distributor (by definition, "installer") must 100% test all site-specific software functions for the system and then provide a detailed report or check list showing the system's operational matrix. This documentation must be part of the "System Status and Programming Report". Provide an alarm and trouble history printout at the SCO inspection, documenting this 100% test.
 - 1. Upon completion of the installation and its programming, the installer's technician shall test every alarm initiating device for proper response and indication, and all alarm notification appliances for effectiveness. Also, in coordination with the other building system contractors, all other system functions shall be verified, including (where applicable) elevator capture and the control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, etc. The engineer shall witness these tests in order to sign the NFPA 72 Record of Completion as the AHJ. The engineer shall fill out the SCO Fire Alarm Systems Checklist and provide this document at the SCO inspection. This can be found at <http://www.ncsco.com>
 - 2. If AHU shutdown occurs for any alarm, then the matrix would indicate the specific control relay(s) for that function being commanded to operate for alarm from any initiating device. If a rolling steel fire door is to drop only upon water flow alarm from its sprinkler zone, or upon any two spot smoke detectors in adjacent spaces being simultaneously in alarm, the matrix would show the door's control relay activating upon alarm from the applicable water flow switch(es), or from any two smoke detectors in the selected spaces (AND gate)
 - 3. The digital communicator shall be on-line and tested for proper communication to the receiving station.
 - 4. All supervised circuits must also be tested to verify proper supervision. (Control circuits and remote annunciation lines are among those required to be supervised.)
 - 5. All testing described above shall be repeated if subsequent software or wiring modifications are determined necessary to meet the requirements of the contract documents. Such re-testing shall be included as part of the base bid and provided at no additional cost to the Owner.
 - 6. The contractor and engineer shall verify the voltage drop of each NAC circuit by testing and recording the voltage at the origin and at the EOL for each NAC circuit, under battery power only. Prior to conducting these tests, the contractor shall verify the candela settings of all strobes. Provide documentation of these tests at the SCO final inspection.
- D. Test Documentation: The installer must fill out and submit the following documentation to the owner, through the engineer, prior to the AHJ's system acceptance inspection:
 - 1. Written verification that this 100% system test was done with copy of print out generated during test.

2. The NFPA 72, "Record of Completion" Form. Use this form (no substitutes) to detail the system installation and to certify that: (a.) It was done per Code, and (b.) The Code required 100% test was performed. The fire alarm installer (manufacturer or authorized distributor's technician) must sign this form. If a representative of the AHJ, owner, or engineer witnesses the tests, in whole or in part, they must also sign the form to signify that fact only (annotating the form as needed to clarify their limited role).
 3. For buildings with a smoke control or smoke purge system, an HVAC balance report, in the smoke control / smoke purge mode.
 4. The System Status and Programming Report described in NFPA 72. This must be generated on the day of the system acceptance inspection and shall include the measured sensitivity of each smoke detector.
 5. The purpose of doing Item (4) on the day of the inspection is to assure detector sensitivity has not been affected by construction dust. Prudent contractors will have taken measures to prevent detector contamination during construction and will also have had the system do a detector sensitivity test and printout prior to the day of the inspection, to make certain all devices are properly programmed and operating within their limits.
- E. After completion of the 100% system test and submission of documentation as described above the installer is to request the engineer to set up an inspection. The system must operate for at least two days prior to this inspection. The responding Fire Department shall be notified of this, for pre- fire planning purposes. On local government projects, local fire authorities may also want to participate in system acceptance inspections. However, for State-owned property they have no inspection jurisdiction and, if present, are only to observe.

3.17 PRE -FINAL INSPECTION:

At the Owner's request and after passing the Designer's pre-final inspection, the Contractor and Manufacturer's authorized installer will conduct system test in the presence of the Owner and the Designer.

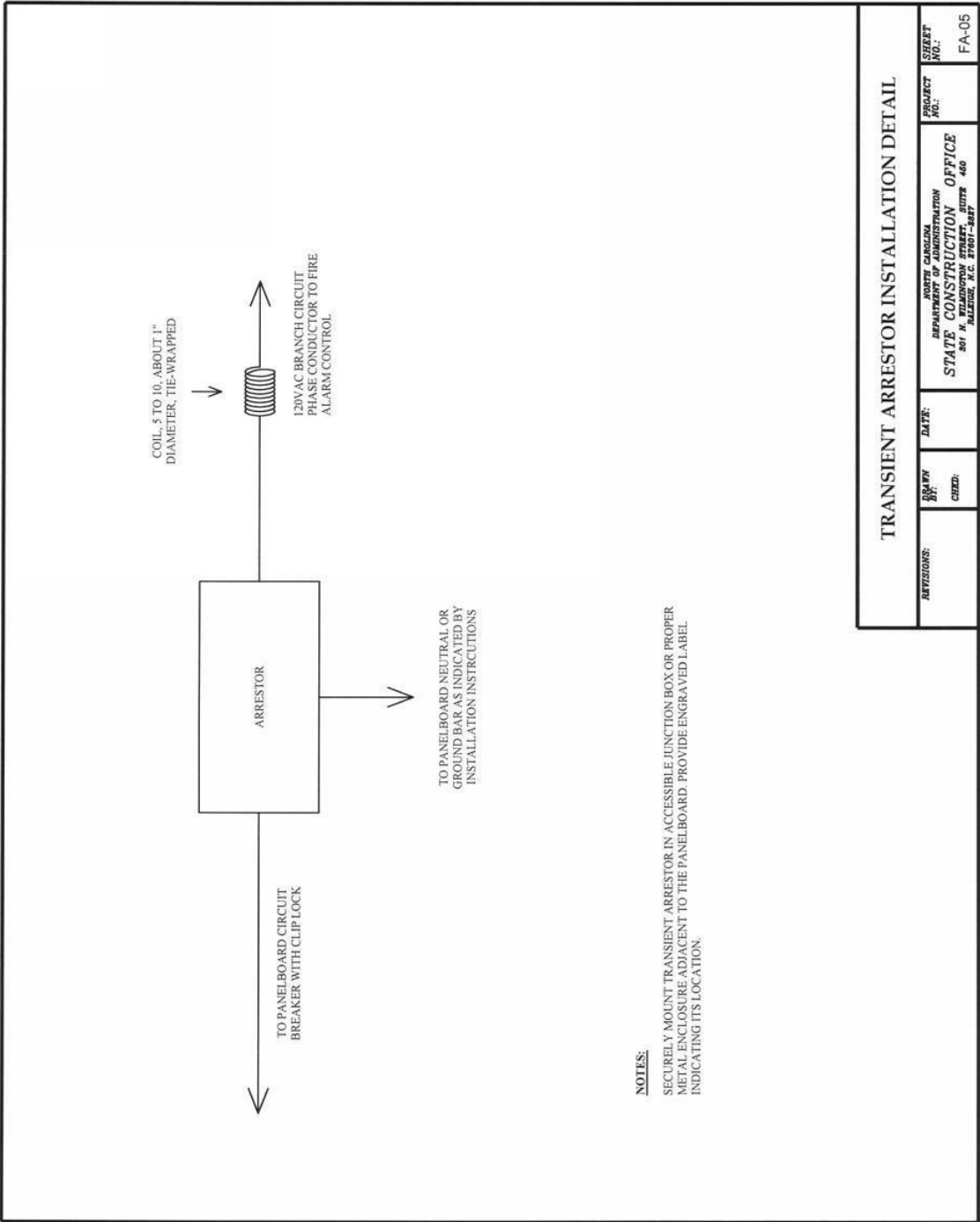
3.18 FINAL INSPECTION:

The fire alarm system will be inspected, with portions of it functionally tested. This will normally include the use of appropriate means to simulate smoke for testing detectors, as well as functionally testing the system interface with building controls, fire extinguishing systems and any off premises supervising station. Operation of any smoke removal system will be checked as instructed by the AHJ. This statistical (sampling) inspection is intended to assure that the contractor has properly installed the system and performed the 100% operational test as required by NFPA 72. The electrical contractor shall provide two-way radios, ladders, keys for resetting elevators and other equipment, and any other materials needed for testing the system, including a suitable smoke source. The Fire Alarm Contractor's technician that programmed the system, shall be present on the day of the SCO inspection(s).

- A. Smoke control and smoke management systems are normally tested by measuring air flow rates and pressure differentials, plus observing any effect the system has on the operation of exit, elevator, and stairway doors. Testing with smoke "bombs" (smoke

candles) is NOT appropriate because they produce cold chemical smoke that lacks buoyancy and, therefore, does not rise like the smoke from a fire.

- B. The test will be conducted entirely by the Contractor. A copy of the final database software must be presented to the Owner before this test. The software shall be loaded from these disks into the system in the presence of the Owner. The review will then be conducted using this software. Any deficiencies shall be recorded and corrected. After the items have been corrected, the system shall be tested again.
- 1. In the event of malfunctions or excessive nuisance alarms, the Contractor must take prompt corrective action. The Owner may require a repeat of the Contractor's 100% system test, or other inspections.
- 2. Test Report: Upon successful completion of the Inspection and after the correction of all deficiencies, the manufacturer's authorized representative shall issue a test report to the Engineer and Owner, detailing and certifying the test.
- 3. System Acceptance: After successful completion of the Final Inspection and recommendation of the Engineer, the system will be accepted by the Owner. At this time the warranty period begins.



END OF SECTION 283100

SECTION 285000 - BI-DIRECTIONAL ANTENNA SYSTEM (BDA)

PART 1 - GENERAL

- 1.1 Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local AHJ (Authority Having Jurisdiction). System users shall receive and transmit radio signals from their portable radio units within the building. This shall be accomplished utilizing the following components:
 - A. Bi Directional Amplifiers (Signal Boosters)
 - B. Coaxial Cable
 - C. Antennas
 - D. Cable taps
 - E. Connectors
 - F. Power dividers
 - G. Other components and interconnecting circuitry as required
- 1.2 The system shall comply with the requirements of UL2524 In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA 72 2013 Edition, NFPA 1221 2019 Edition and 2018 NC Fire Code, as referenced.
- 1.3 The entire system shall meet the requirements of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).
- 1.4 The work in this section shall include the responsibility for all permit requirements with the AHJ. Where filings require engineer's signature, documents shall be submitted for his review and signature. This responsibility shall include furnishing of required quantities of floor plans, descriptive notes and/or specifications, wiring diagrams, shop drawings and amendment forms.
- 1.5 Early completion of the in-building emergency radio communication enhancement system will be required as to permit a Certificate of Occupancy to be obtained in a timely manner.
- 1.6 Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included
- 1.7 The in-building emergency radio communication enhancement system shall use a UL2524, NFPA 72, NFPA 1221 and IFC 2018 compliant signal booster.
- 1.8 Submittals
 - A. Prior to performing any installation work. The fire alarm contractor shall submit complete Shop Drawings to the engineer for review. Upon approval by engineer, the contractor shall submit to AHJ for approval. The shop drawing shall clearly demonstrate compliance with the engineer's plans and specifications. Any non-compliant features must be fully described.

- B. Shop drawing submittal shall include a copy of the valid FCC-issued general radio operators license who design the system.

1.9 Authority Having Jurisdiction (AHJ):

The AHJ for BDA system code compliance is the Duplin County Fire Marshal Office. Contractor shall field coordinate site Inspections with AHJ.

PART 2 - PRODUCTS

- 2.1 The system specified shall be based upon UL2524, NFPA72, NFPA 1221 compliant signal boosters
- 2.2 The signal booster shall be a Class B Public Safety type as designated by the FCC or as required by the AHJ.
- 2.3 The secondary power supplies, battery chargers and system monitoring shall be fully compliant with NFPA 72, NFPA 1221 and 2018 NC Fire Code. The signal booster shall have both the primary and the secondary power supplies within a waterproof, type-4 approved enclosure.
- 2.4 All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be shown on the product datasheets and technical submittals. The ID must also be displayed on the product as required by the FCC.
- 2.5 The signal booster shall be pre-set by the equipment manufacturer for the frequencies specified by the AHJ. Field tuning of RF filters and duplexers is not allowed.
- 2.6 UHF and VHF signal boosters shall be band selective type with a maximum 3dB channel bandwidth of 200KHz (Fc +/- 100KHz) per band. Non-selective wide-band signal boosters shall not be accepted, unless required to cover multiple channels within the same band.
- 2.7 Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed.
- 2.8 Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building). Systems that produce any measurable level of uplink noise while in standby shall not be allowed.
- 2.9 Signal Booster gain shall be rated at minimum of 80dB and the gain shall be adjustable in a minimum of 30dB range. System gain shall be set and documented at the time of the final system test.
- 2.10 Maximum Propagation delay of the signal booster system shall be 14μs (microseconds) or as specified by AHJ.
 - A. The signal booster system shall include built-in automatic supervision of malfunctions of the signal booster and battery system as per NFPA 1221 NFPA 72 and 2018 NC Fire Code. Non-OEM equipment add-ons and modifications to comply with this specification shall not be allowed.

- B. A dedicated supervised monitoring panel shall be provided within the emergency command center next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
 - 1. Normal AC power
 - 2. Signal booster trouble
 - 3. Antenna Failure
 - 4. Loss of normal AC power
 - 5. Failure of battery charger
 - 6. Low battery capacity
- C. External filters, duplexers, power supplies or other non-OEM additions or modifications of the original equipment shall not be allowed. All duplexers shall be built-in and FCC certified with the signal booster as an complete and fully integrated FCC-certified and UL-Listed unit.
- D. All signal booster components shall be contained in a type-4 approved waterproof enclosure. All enclosures shall be painted red with external labeling as required by the AHJ.

PART 3 - EXECUTION

3.1 Design requirements

- A. Contractor shall provide system design as stated in 2018 NC Fire Code section 510.4.
- B. In-building emergency radio communication enhancement systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.
- C. Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas shall be provided with 100% floor area radio coverage.
- D. General building areas shall be provided with 95% radio coverage, or as specified by AHJ.
- E. The In-building emergency radio communication enhancement systems must provide the following signal strengths:
 - 1. Downlink - Minimum signal strength of -95 dBm throughout the coverage area.
 - 2. Uplink - Minimum signal strength of -95 dBm received at the AHJ Radio System.

3. OR As otherwise required by the AHJ
- F. The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.
 - G. An approved manufacturer or a qualified and approved vendor shall supply, test and determine locations of components which are required for proper operation as well as to supply, install, test and certify the performance of the complete system. Vendor qualifications must be acceptable to the AHJ.
 - H. Design shall include software-simulated radio propagation modeling with heat maps showing predicted signal coverage levels within the building. The design shall be done by the software certified personnel.
 - I. All tests shall be conducted, documented, and signed by a person in possession of an FCC General Radio Telephone Operators License. All testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must be acceptable to the AHJ.
 - J. The system design shall be based on the Public Safety Signal Boosters UL2524, NFPA 72, NFPA 1221, 2018 NC Fire Code and FCC certified to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waive any requirement or performance of individual components described in the specifications.
 - K. Assembly and installation of all components of the Emergency Responder Radio Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.
 - L. Survivability from attack by fire shall meet requirements of NFPA 72, NFPA 1221, 2018 NC Fire Code or as required by the local jurisdiction.
 - M. The system must comply with all applicable sections of the FCC rules. Signal booster shall have FCC certification prior to installation.
 - N. Antenna isolation shall be maintained between the donor antenna and all inside antennas (Distributed Antenna System - DAS) to a minimum of 20dB under all operating conditions
- 3.2 Approval prior to installation. Amplification system capable of operating on frequencies licensed to any public safety agency by the FCC shall not be installed without prior coordination and approval of the fire code official.
- 3.3 Installation of all components of the Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code NFPA-70, NFPA-72, NFPA 1221, 2018 NC Fire Code or as required by the local AHJ.
- 3.4 At least 2 independent and reliable power supplies shall be provided as specified in NFPA 72, NFPA 1221 and 2018 NC Fire Code.
- 3.5 The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, NFPA 72 and NFPA 1221 2016 edition.

The signal booster shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall power on automatically when the primary power source is lost. The secondary source of power shall be capable of operating the emergency responder radio coverage enhancement system for a period of at least 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a waterproof Type-4 approved enclosure. Batteries shall be enclosed in a separate, vented Type-3R approved enclosure. External UPS (Uninterruptable Power Supplies) are not acceptable.

- 3.6 RF Coaxial Cable shall be a listed, CMP plenum. Non-plenum cable can be used when installed in a metallic raceway. The cable classification shall be clearly marked on the outer surface of the cable regular intervals.
- 3.7 Acceptance and Test Procedures
- A. The acceptance test procedure shall be as stated in 2018 NC Fire Code section 510.5.3 or as directed by the AHJ.
 - B. Acceptance testing for an in-building radio system is required upon completion of installation.
 - C. The coverage testing shall be done in accordance with NFPA 72, NFPA 1221, 2018 NC Fire Code and as required by the local AHJ
 - D. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.
 - E. All test records along with system diagrams, design, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted upon completion of the project, and as required by the AHJ.

END OF SECTION 285000

SECTION 285500 - RF SURVEY FOR EMERGENCY RESPONDER RADIO ANTENNA/REPEATER
SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. The purpose of this specification is to establish the requirements and standards for initial survey for public safety radio signal strength per NFPA and 2018 NC Fire Code.
- B. Survey should be performed after the building is substantially completed, and prior to start of installation of electrical wiring.
- C. Conduct a survey using a RF Spectrum Analyzer, a calibrated, system-compatible radio or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength of Emergency Responder Radio Signal into the building and determine if amplification of the signal is required. Both inbound and outbound signal strength shall be determined, measured, calculated and documented as required by code.

1.2 SURVEY CRITERIA IF REQUIRED

- A. The required Public Safety Radio Signal Level inside the Owner's facility must be determined per code, ordinance or AHJ
- B. Survey shall be performed by an FCC licensed technician holding a current GROL license. Honeywell Fire have distributors that meet these requirements.

1.3 REGULATIONS

- A. Codes, regulations and standards referenced in the Section are:
 - 1. NFPA 1 – The National Fire Code (including Annex O from 2009)
 - 2. NFPA 70, 2020 Edition – The National Electrical Code
 - 3. 2018 NC Fire Code, Section 510- Emergency Responder Radio Coverage
 - 4. NFPA 101, Life Safety Code, the Ohio Building Code, and Local Code and Building Authority requirements.
 - 5. NFPA 72, 2013 Edition - National Fire Alarm Code
 - 6. FCC 47 CFR Private Land Mobile Radio, Part 90.219 Services-Use of Signal Boosters
 - 7. 2018 NC Building and Fire Codes
 - 8. ADA "Americans with Disabilities Act"
 - 9. FCC's OET 65 Standards "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields"
 - 10. FCC Rules Part 22, Part 90 and Part 101

11. NFPA 1221 2016 Edition

12. UL 2524

1.4 DEFINITIONS

A. Definitions:

1. Bi-Directional Amplifier BDA: Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.
2. Emergency Responder Radio Coverage System: A two-way radio communication system installed to assure the effective operation of radio communications systems for fire, emergency medical services, or law enforcement agencies within a building or structure. A system used by firefighters, police, and other emergency services personnel.
3. FCC: Federal Communications Commission
4. OET 65 Standards: FCC's Bulletin 65 provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
5. Public Safety/First Responder: Public Safety or First Responder agencies that are charged with the responsibility of responding to emergency situations. These include, but are not limited to law enforcement departments, fire departments, and emergency medical companies.
6. RSSI: Received signal strength indicator RSSI is a measurement of the power present in a received radio signal.
7. BER: Bit Error Rate is the number of bit errors per unit time
8. GROL- FCC General Radio Operators License
9. ERRCES- Emergency Responder Radio Coverage Enhancement System
10. DAS-Distributed Antenna System

PART 3 - EXECUTION

3.1 TESTING PROCEDURES

- A. Minimum Signal Strength: For testing system signal strength and quality, the testing shall be based on the. -95dBm nominal signal at 100%.
- B. Spectrum Analyzer or Calibrated Handheld Radio shall be used as basis for signal measurements or other method as approved by AHJ.
- C. Testing should be based on a minimum of 20 grid locations per floor OR maximum of 1600 SQ ft. areas if the floor exceeds 32,000 Sq. Ft. Also, testing should include all critical areas per NFPA. See A.2 of this specification and NFPA 72 2013 or NFPA 1221 2016. OR per any method determined by the AHJ, local code or ordinance.

- D. A minimum signal strength of -95 dBm shall be provided throughout the coverage area for both uplink and downlink by the Local Fire Department.

- 1. RSSI measurement only

3.2 SURVEY SUBMITTALS

- A. Submit testing data for each level of the building.
 - 1. An RF measurement drawing of each floor of the building which indicates relative RF field strength for each frequency band of interest must be submitted to the AHJ.
 - 2. The drawing should indicate clearly the areas that have passed or failed based on the above parameters.

END OF SECTION 285500

SECTION 310000 – GENERAL SITEWORK AND EARTHWORK REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SITEWORK LAYOUT

- A. Monuments and Benchmarks
 - 1. Maintain all monuments, property corners, bench marks and other reference points.
 - 2. If these are disturbed or destroyed during construction operations, have them replaced by a surveyor licensed in the State of North Carolina. This replacement shall be at no additional expense to the Contract.
- B. Laying out the Work.
 - 1. Locate all existing bench marks and other reference points.
 - 2. Protect these points throughout construction.
 - 3. Layout work utilizing these reference points.
- C. Record Drawings
 - 1. Maintain a record of the locations of all underground utilities and piping.
 - 2. Maintain a record of any variations of the work.
 - 3. Record Drawings shall be certified by a Land Surveyor registered in the State of North Carolina.
 - 4. Submit these record drawings at Project Closeout.

1.3 EASEMENTS

- A. N/A

1.4 MAINTENANCE OF TRAFFIC

- A. Maintain vehicular and pedestrian traffic across the frontage of this project. Comply with all applicable safety requirements.

1.5 SUBMITTALS

- A. For those submittals, close-out documents and O&M manuals requiring review by the architect's consultants, contractor shall ship such documents directly to the consultant, while sending a copy of the transmittal to the architect.

1.6 CORRELATION OF CONSTRUCTION DOCUMENTS

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

1.7 PROJECT CONDITIONS

- A. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.
- C. Should charted, uncharted or incorrectly charted utilities be encountered during demolition, contact the Architect immediately for instructions. Cooperate with Owner and utility companies to keep services and facilities in operation.
- D. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Civil Engineer and then only after acceptable temporary utility services have been provided.
 - 1. Provide a minimum 48-hours' notice to the Civil Engineer and receive written notice to proceed before interrupting any utility.

1.8 SCHEDULING

- A. Provide schedule in accordance with the contract.

PART 2 - PRODUCTS

Not Applicable

PART 3 – EXECUTION

3.1 PROJECT CLEAN UP

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

3. Remove all trash and debris.

3.2 EXISTING FACILITIES

- A. Preserve existing signs, markers, guardrails and fences in their original condition unless written permission is obtained for their removal and replacement.
- B. Replace damaged items at no additional cost to the Contract.

END OF SECTION 010200

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Standards set forth by the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Land Resources, Land Quality Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Removal of trees and other vegetation.
 - 2. Clearing and grubbing.
 - 3. Removing above-grade improvements.
 - 4. Removing below-grade improvements.
- B. Related Sections:
 - 1. Division 01 Section "Construction Waste Management".
 - 2. Division 31 Section "Earth Moving".
 - 3. Division 31 Section "Erosion Controls".

1.3 PROJECT CONDITIONS

- A. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.
- C. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- D. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
 - 3. All erosion control measures shall be in place prior to commencement of clearing operations.
- E. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess

foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
 2. Provide protection for roots over 1-1/2 inch (38 mm) in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
 3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Architect. Employ a licensed arborist to repair damage to trees and shrubs.
 4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.
- F. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.

1.4 EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.
- C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 – PRODUCTS

None Used.

PART 3 – EXECUTION

3.1 SITE CLEARING

- A. General: Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site removal of stumps and roots.
 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 2. Existing trees within clearing limits may be chipped and stockpiled on-site but NOT respread as landscape mulch.
- B. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

- a. Place fill material in horizontal layers not exceeding 6 inches (150 mm) loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.
- C. Topsoil Stripping: Strip and stockpile existing topsoil within construction limits for re-spreading. Should the Contractor elect to remove topsoil from the site, suitable topsoil from off-site sources shall be provided for re-spreading at no cost to the Owner.
 1. Remove sod and grass before stripping topsoil.
 2. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. All surface topsoil, regardless of thickness encountered, shall not be considered Unsuitable Soil.
 3. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
 4. Stockpile topsoil materials within construction limits and away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 5. Do not stockpile topsoil within tree protection zones.
 6. Dispose of excess topsoil off-site.
- D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
 1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings and is included under work of related Division 22 Sections. Removing abandoned underground piping or conduits interfering with construction is included under this section.

3.2 DEMOLITION PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations or as shown on the drawings.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective site demolition area.
 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction or as shown on the plans.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
- C. Provide and maintain exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.
- D. Protect trees, fences, poles, mailboxes, and all other property unless their removal is authorized. Any property damaged, that is not authorized for removal, shall be restored or replaced to the Owner's satisfaction.

3.3 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective site demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
- C. Utility Requirements: Refer also to Division 15 and 16 Sections for additional requirements for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective site demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Utility Adjustments and Relocaitons: Adjust locations, elevations and routes of existing utility lines, poles, guys, vaults, handholes, boxes, and other related appurtenances as required to facilitate new construction. Coordinate adjustments and relocations with utility companies.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective site demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE SITE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete Work within limitations of governing regulations.
 - 1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 - 2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish asphalt, concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.

- C. Remove sawcut concrete and asphalt, including aggregate base, to a depth of 12-inches below existing, adjacent grade, or as indicated. Provide neat sawcut at limits of pavement removal as indicated.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective site demolition operations.
- B. Where repairs to existing surfaces are required, match previous work as closely as possible.
 - 1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.7 CLEANING

- A. Keep the site free from debris and hazards and inspect the site at the end of each day for trash. All adjacent roads and drives outside of the construction fencing shall remain in operation during construction and shall remain free of all construction materials and debris.

3.8 DISPOSAL OF WASTE MATERIALS

- A. General: Promptly and dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning on Owner's Property: Burning is not permitted on Owner's property.
- C. Removal from Owner's Property: Remove waste materials and unsuitable or excess soils and mulch from Owner's property. Transport demolished materials off Owner's property and legally dispose of them.
- D. Recycling: Contractor shall not dispose of excess soil and land clearing debris in landfills. 100% of soil and land clearing debris shall be recycled. Provide documentation verifying 100% recycling of cleared trees and stumps and excess soil materials. Refer to Division 01 section – Construction Waste Management for additional requirements.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

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. Preparing and grading subgrades.
 - 2. Excavating and backfilling for structures.
 - 3. Base course for walks and pavements.
 - 4. Excavating and backfilling trenches.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 01 Sections for allowances, definitions and procedures.
 - 2. Division 31 Section 311000 "Site Clearing" for site stripping, grubbing, topsoil removal, and tree protection.
 - 3. Division 33 Section 3341000 "Storm Drainage Utilities" for storm drainage, foundation drainage connections outside of building and roof drainage connections outside of building.
 - 4. Division 31 "Soil Erosion and Sediment Control", for all areas of the site that are graded or disturbed by any construction operations

1.3 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
 - 1. 24 inches outside of concrete forms other than at footings.
 - 2. 12 inches outside of concrete forms at footings.
 - 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - 4. 6 inches beneath bottom of concrete slabs on grade.
 - 5. 6 inches beneath invert elevation of pipe in trenches, and the greater of 24 inches wider than pipe diameter or 42 inches wide.
- B. Unit prices for unsuitable soil and rock removal shall include all work and materials as defined in Division 01 sections.

1.4 DEFINITIONS

- A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed. Refer to the following section for additional definitions of classified excavations.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base course, drainage fill, or topsoil materials.

REGION 1 HEADQUARTERS

- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Surface Course: The top layer of the pavement structure placed on base course or subgrade.
- E. Base Course: Layer placed between the subgrade elevation and asphalt paving courses.
- F. Bedding Course: Layer placed over excavated subgrade in a trench before laying pipe.
- G. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Civil Engineer. Unauthorized excavation, as well as remedial work directed by the Civil Engineer, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.5 EXCAVATION CLASSIFICATIONS

- A. Excavation Classifications: All excavation is classified as General Excavation except for Rock and Unsuitable Soil Materials as defined in this section.
 - 1. General Excavation: Excavation, removal and/or disposal of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and/or removed; together with soil, boulders, and other materials encountered that are not classified as rock, unsuitable soil, or unauthorized excavation.
 - a. Intermittent drilling, or ripping to increase production and not necessary to permit excavation of material encountered will be considered general excavation.
 - b. Soil (irregardless of nature) or other debris encountered above proposed subgrade elevations shall be considered general excavation unless determined by the Civil Engineer to meet the definition of rock.
 - 2. Unsuitable Soil Excavation: Removal and disposal of soil materials or other debris encountered at or below proposed subgrade elevations which is deemed unsuitable to remain in place by the Civil Engineer or Owner's Independent Testing Agency.
 - a. Soil and/or other debris encountered above proposed subgrade elevations shall be considered general excavation.
 - b. Soil material which, in the opinion of the Civil Engineer or Owner's independent testing agency, can be repaired by scarifying, drying and recompactng or material which is made unsuitable by delay of work, lack of protection or other actions of the Contractor or his Sub-Contractors shall not be considered as unsuitable soil and shall be repaired or replaced by the Contractor at no additional cost to the Owner.
 - c. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Civil Engineer will be considered as general excavation.
 - d. Surface topsoil, regardless of thickness encountered, shall not be considered unsuitable soil.
 - e. Stones, rocks and boulders not meeting classifications of rock shall not be considered unsuitable soil. Stones, rocks and boulders shall be removed from soil as necessary if soil is to be used as fill or backfill. Removed stones, rocks and boulders shall be removed from the site.

REGION 1 HEADQUARTERS

3. Mass rock Excavation: Removal, in open excavations, of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.5-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, or ripping, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Civil Engineer.
 - a. Mass Rock Excavation Equipment: Late-model, track-type CAT D-8 crawler tractor operating at one mile per hour in the lowest available gear, and at the highest normal operating rpm pulling a sharp, single-toothed ripper. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the backhoe to be used for demonstration purposes. The Contractor shall demonstrate (at no additional cost) to the Civil Engineer or Owner's independent testing agency that the rock cannot be practically ripped with equipment equivalent that specified above without systematic drilling. Mass rock is defined as material which, after 1 hour of continuous ripping using the equipment described above, produces less than 10 cubic yards of removeable material.
4. Trench Rock Excavation: Removal, in trench excavations, of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.0-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, or ripping, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Civil Engineer.
 - a. Trench rock excavation equipment: Late-model, track mounted CAT 330 or equivalent hydraulic excavator equipped with a narrow bucket with new rock teeth and operating at the highest normal operating RPM. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the backhoe to be used for demonstration purposes. Trench rock is defined as material which, after 1 hour of continuous digging using the equipment described above, removes at less 30 cubic yards material.
5. Classified excavation requirements:
 - a. Excavations more than 10 feet in width and pits more than 30 feet in either length or width are defined as open excavations. Excavations less than 10 feet in width and pits less than 30 feet in both length and width are defined as trench excavations.
 - b. Contractor shall expose and clean the rock material for inspection and measurement by the Civil Engineer.
 - c. Do not excavate rock or unsuitable soil until it has been classified and cross-sectioned by the Owner's independent testing agency or Civil Engineer. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Civil Engineer will be considered as unclassified excavation.
 - d. The Civil Engineer shall be the final judge on what is classified as unsuitable or rock excavation.
 - e. The contractor may be required to provide equipment specification data verifying that the above minimum-rated equipment will be used for demonstration purposes. The equipment shall be in good repair and in proper working condition.
 - f. Rippable rock, weathered rock or overburden which is not classified as rock according to the above definitions shall be considered General Excavation.

1.6 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Test Reports: In addition to test reports required under field quality control, submit the following:
 - 1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
 - 2. One optimum moisture-maximum density curve for each soil material.
 - 3. Reports of all laboratory and field tests including evaluations of subgrades and foundation bearing conditions.
 - 4. As-built survey of athletic fields, courts and tracks demonstrating compliance with specified tolerances.
- C. Report of rock or unsuitable soil removal with quantities confirmed in writing by the Civil Engineer or Owner's independent testing agency.
- D. Product data in the form of manufacturer's technical data, specifications, and installation instructions for porous gravel walkway reinforcement mat.

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction. Any earthwork required for preparation of parking areas and drives shall comply with current NCDOT Standard Specifications as per the North Carolina Construction Manual.
- B. Comply with applicable requirements of NFPA 495--Explosive Materials Code.
- C. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
 - 1. Off-site borrow material, if any, shall be tested and inspected prior to its use. All soil tests done to qualify off-site fill material for use on-site shall be paid by the Contractor as well as compaction retests required due to failure of the original tests.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01.
 - 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Civil Engineer, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.8 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Civil Engineer and then only after acceptable temporary utility services have been provided.
 - 1. Provide a minimum 48-hours' notice to the Civil Engineer and receive written notice to proceed before interrupting any utility.

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- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.
- C. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- D. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

1.9 PAYMENT

- A. General Excavation: All general excavation to the lines and grades indicated on the drawings, and to the bottom of utility trenches, including all necessary off-site disposal of excess materials and/or off-site borrow of fill materials shall be included in the base bid.
 - 1. No statement is made or implied that the on-site grading and earthwork indicated on the drawings is balanced.
- B. Unsuitable Soil Material Excavation: Unsuitable soil material excavation in excess of the project allowances will be paid by unit prices included in the Contract Documents.
 - 1. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.
- C. Rock Excavation: Rock excavation in excess of the project allowances will be paid by unit prices included in the Contract Documents.
 - 1. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.

1.10 ADDITIONAL WORK

- A. Claims for concealed, unknown, or unanticipated subsurface conditions are limited to those circumstances where:
 - 1. Additional excavation work is required below the contract limits indicated to provide acceptable bearing for building pad, structures or pavements.
 - 2. Additional excavation work is required to raise, lower, or revise the footings, foundations or other parts of the building to provide acceptable bearing.
 - 3. Additional excavation work below the bottom of utility trench elevations, for utilities outside the limits of the building, as required to provide acceptable bearing for the utility.
 - 4. Rock is encountered between existing grade and design subgrade.
- B. The risks of concealed, unknown, or unanticipated subsurface conditions (except for rock) from existing ground surface to the design subgrade elevations in cut areas and to subsoil elevations in fill areas shall be included in the Contract Amount and shall not be considered as grounds for additional costs to the Contract. The risks of concealed, unknown, or unanticipated subsurface conditions below the elevations stated above shall be considered as Additional Excavation.

- C. During construction, if concealed, unknown, or unanticipated subsurface conditions are encountered which require that footings, foundations or other parts of the building be raised, lowered or revised to provide acceptable bearing for the building or if, outside the building limits, additional depth of utility trench excavation below the design subgrade or subsoil elevations is required, immediately notify the Architect upon discovery of such condition prior to disturbing the material encountered.
- D. Payment for additional Work
 - 1. Additional excavation shall be counted toward the unit price allowances established in the Bid Form. *The Owner reserves the right to negotiate said unit price allowances prior to the Award of Contract.*
 - 2. Lowering of footings shall be paid for at a negotiated amount. The additional excavation involved shall be counted toward the unit price allowance.
 - 3. Rock removal, if required, shall be counted toward the unit price allowances established in the Bid Form. All rock removal required to complete work other than trenching shall be paid for at the unit price for mass rock removal. Rock payment lines are limited to the following:
 - a. Two feet outside of concrete work for which forms are required, except footings.
 - b. One foot outside perimeter of footings, two feet below bottom of footings.
 - c. In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than outside diameter of pipe, but not less than 3 feet minimum trench width.
 - d. Outside dimensions of concrete work where no forms are required.
 - e. Under slabs on grade, 6 inches below bottom of concrete slab.
 - 4. No payment will be made for unauthorized excavation.
 - 5. The expense of surveying quantities of rock removal and additional excavation shall be included in the unit price allowances.

1.11 EARTHWORK BALANCE ADJUSTMENTS

- A. Adjustments of grades may be allowed with prior written approval of the Architect in order to accommodate shortfall or surplus of material that may occur. Should adjustments be allowed, maintenance of designed drainage patterns and required adjustments to drainage structures shall be a contract responsibility. No additional payment will be made for these adjustments.
- B. Should material be required to be imported or exported to achieve the finish grades indicated on the drawings, importation and excavation and disposal off-site in a legal manner of the required material shall be a contract responsibility. No additional payment will be made for these operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GC, GP, GM, ML, CL, SW, SP, SC, and SM; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter; with a Plasticity Index less than 25 and a Liquid Limit less than 50. Soils free of organics and having a plasticity index greater than 25 and a liquid limit greater than 50 may be used as fill in approved non-structural areas.

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- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups MH, CH, OL, OH, and PT. Soils having a Plasticity Index greater than 25 and a Liquid Limit greater than 50 are also unsatisfactory within structural (building and pavement) areas.
- D. Unsuitable Soil: Existing, in-place soil, materials or other debris encountered at or below proposed subgrade elevations deemed unsuitable by the Civil Engineer or the Owner's independent testing agency to remain in place and/or for use as fill or backfill material or subgrade. Soil material which, in the opinion of the Civil Engineer or Owner's independent testing agency, can be repaired by scarifying, drying and recompacting and/or material which is made unsuitable by delay of work, lack of protection or other actions of the Contractor or his Sub-Contractors shall not be considered as unsuitable material and shall be repaired or replaced by the Contractor at no additional cost to the Owner. Moisture content alone shall not be the determining factor as to the presence of unsuitable soil. Topsoil shall not be considered unsuitable regardless of thickness from the existing ground surface.
- E. Backfill and Fill Materials: Satisfactory soil materials.
- F. Base Course Material: Type A aggregate base course meeting the requirements of Section 520 of NCDOT "Standard Specifications for Roads and Structures."
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding Material: #57 washed stone.
- I. Drainage Fill: #57 washed stone.
- J. Filtering Material/Stone: #57 washed stone.

2.2 PROCESSED AGGREGATE MATERIALS

- A. Base Course Material: Type A aggregate base course meeting the requirements of Section 520 of NCDOT "Standard Specifications for Roads and Structures."
- B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- C. Bedding Material: #57 washed stone.
- D. Drainage Fill: #57 washed stone.
- E. Filtering Material: #57 washed stone.

2.3 ACCESSORIES

- A. Drainage (Filter) Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
 - 2. Tear Strength: 40 lbf (178 N); ASTM D 4533.

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3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
 4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
 5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.
- B. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
 2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
 3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
 4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
 5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.
- C. Biaxial Geogrid: Integrally formed biaxial geogrid, specifically manufactured for use as a base reinforcement for subgrade improvement with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Aperture Dimensions: 1-in (25-mm) nominal.
 2. Minimum Rib Thickness: 0.03-in (0.76-mm) nominal.
 3. Tensile Strength @ 2% Strain: 280-lb/ft (4.1 kN/m); ASTM D-6637.
 4. Tensile Strength @ 5% Strain: 580-lb/ft (8.5 kN/m); ASTM D-6637.
 5. Ultimate Tensile Strength: 850-lb/ft (12.4 kN/m); ASTM D-6637.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 2. Install a dewatering system to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES AND BLASTING

- A. Obtain permit for blasting and use of explosives.

3.4 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. Contractor is responsible for ensuring all excavation operations and other construction comply with applicable OSHA requirements. Contractor shall provide temporary shoring and bracing as needed to construct the proposed improvements and comply with the above requirements.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- B. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: As indicated
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
 - 1. For pipes or conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches (150 mm) below invert elevation to receive bedding course.

3.8 APPROVAL OF SUBGRADE PRIOR TO PLACING FILL OR OTHER IMPROVEMENTS

- A. Notify Civil Engineer when excavations have reached required subgrade.

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- B. After stripping is complete the exposed subgrade shall be proofrolled with a fully loaded dual wheel tandem axial dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Civil Engineer. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompacted. Repeat proofrolling operations.
- C. When Civil Engineer or Owner's independent testing agency determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. Unforeseen additional excavation and replacement with suitable material approved by the Civil Engineer will be considered unsuitable material and will be paid by unit prices included in the Contract Documents. Refer to Division 01 Sections.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Civil Engineer. Install french drains at design subgrade if directed by the Owner's independent testing agency and approved by the Civil Engineer.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Civil Engineer.
 - 1. Fill unauthorized excavations under other construction as directed by the Civil Engineer or the Owner's independent testing agency.
- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Civil Engineer.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Testing, inspecting, and approval of underground utilities.
 - 4. Concrete formwork removal.
 - 5. Removal of trash and debris from excavation.
 - 6. Removal of temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
 - 8. Removal of objectionable materials, including rocks larger than acceptable size, from backfill soils.

3.12 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Pipe sleeves and concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches (450 mm) of footings. Place concrete to level of bottom of footings. Contact the Civil Engineer or the Owner's independent testing agency to coordinate details, procedures and possible alternatives.
- C. Provide 4 inch (100 mm) thick concrete base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway base course.
- D. Place and compact initial backfill of satisfactory soil material or base course material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.
- G. Place and compact final backfill of satisfactory soil material to final subgrade.
- H. Install detectable warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
 - 1. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
- B. Obtain approval of subgrade as specified prior to placing fill.
- C. Place fill material in layers to required subgrade elevations for each location listed below.
 - 1. Under grass, use satisfactory excavated or borrow soil material.
 - 2. Under walks, pavements, buildings and other structural areas use base course material, or satisfactory excavated or borrow soil material.
 - 3. Pond embankments, use impervious fill.
- D. Following placement of fill the subgrade of building and pavement areas shall be proofrolled as described in the Field Quality Control section. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompact. Repeat proofrolling operations.

3.14 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
 - a. Stockpile or spread and dry removed wet satisfactory soil material.

3.15 COMPACTION

- A. Place backfill and fill materials in layers not more than 6-8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.
- C. Compaction and Percentage of Maximum Dry Density Requirements:
 - 1. Compact soil to not less than the following percentages of maximum dry density according to ASTM D698 Standard Proctor:
 - a. Under structures, steps, walks, courts, tracts, future helipad area. and pavements, compact each layer of backfill or fill material at 95% of the standard Proctor Density (ASTM D-698). Moisture content of the fill during placement shall be kept within 2% from the optimum moisture.
 - b. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material at 90 percent maximum dry density.
 - 2. Compact each layer of aggregate base material under pavement to 100% density in accordance with AASHTO T-180 as modified by NCDOT.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between existing adjacent grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1.2 inches (0.10 foot).
 - 2. Walks: Plus or minus 1.2 inches (0.10 foot).
 - 3. Pavements: Plus or minus 1/2 inch (0.05 foot).

3.17 SUBSURFACE DRAINAGE (FRENCH DRAINS)

- A. Drainage Piping: Drainage pipe is specified in Division 33 Section "Storm Utility Drainage Piping."
- B. Subsurface and Foundation Drains: Place a layer of drainage fabric around perimeter of drainage trench. Place a course of drainage fill material on drainage fabric to support drainage pipe. Encase

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drainage pipe in drainage fill material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.

1. Compact each course of drainage fill material.
2. Place satisfactory excavated or borrow soil material or topsoil fill material (as appropriate) over drain to final grade.

3.18 BASE COURSES

- A. Under pavements, walks, courts and tracks, place base course material on prepared subgrades.
 1. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 100 percent density in accordance with AASHTO T-180 as modified by NCDOT.
 2. Shape base course to required crown elevations and cross-slope grades.
 3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
 4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.
 5. Following compaction testing and within 48 hours prior to the application of asphalt or concrete pavement, the aggregate base course shall be proofrolled with a fully loaded dual wheel tandem axial dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Civil Engineer. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the base course shall be scarified and moistened or aerated and recompacted. Repeat proofroll testing.
- B. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders at least 12 inches (300 mm) wide of acceptable soil materials and compact simultaneously with each base course layer.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), or equal.
 2. Paved Areas (including stream/pool): At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests. Observe proofrolling of finished subgrade and aggregate base course.
 3. Trench Backfill: Perform at least one field in-place density test per 2 feet of backfill per 200 linear feet or less of trench, but no fewer than two tests per trench per day.
 4. Non-Structural Areas: Field density and moisture content tests shall be performed on the fill and backfill at a rate of one test per every 5,000 square yards of fill per lift, per day
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.
- C. Proofrolling: Subgrade to receive fill, finish subgrade of building or pavement areas, and aggregate base courses shall be proofrolled with a fully loaded dual wheel tandem axial dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after

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proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompacted. Repeat proofrolling operations.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace material to depth directed by the Civil Engineer; reshape and recompact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, excess topsoil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 312000

SECTION 31 2500 – EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The plan Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this Section.
- B. The latest edition of the North Carolina Department of Environmental Quality's Erosion and Sedimentation Control Planning and Design Manual (hereafter referred to as NCDEQ Manual).

1.2 SUMMARY

- A. This Section includes the installation, maintenance, and removal of erosion control measures required for the prevention of sediment leaving the project site. This applies to all areas of the site that are graded or disturbed by any construction operations, and elsewhere as indicated on the Drawings or specified herein. Erosion control shall be implemented and operated as specified herein, and as may be required by actual onsite conditions and governing authorities.
- B. The Contractor is fully responsible for all applicable permits and approvals for offsite borrow and waste areas.
- C. The Contractor shall have full responsibility for the construction and maintenance of erosion and sedimentation control facilities as shown on the Drawings and as specified herein. The Contractor shall, at all times, provide the operation and maintenance necessary to operate the permitted and required sediment and erosion controls at optimum efficiency.
- D. The Contractor shall provide temporary or permanent ground cover as soon as possible over disturbed areas of the site and shall provide temporary or permanent ground cover no more than 30 days after construction activities have permanently or temporarily ceased throughout the disturbed area. Temporary or permanent ground cover shall be provided on slopes within 7 days (or as allowed by NPDES Permit) after construction activities have permanently or temporarily ceased.
- E. Related Sections. The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Site Clearing".
 - 2. Division 31 Section "Earth Moving".
 - 3. Division 32 Section "Planting".
 - 4. Division 32 Section "Lawns and Grasses".

1.3 MONITORING AND RECORD KEEPING

- A. The Contractor shall abide by all conditions of the General Permit to Discharge Stormwater under the National Pollutant Discharge Elimination System (NPDES), Permit No. NCG010000 (obtain copy from Owner) and the general requirements listed below. NPDES General Permit No. NCG010000 can be viewed at:
<https://www.deq.nc.gov/energy-mineral-and-land-resources/stormwater/npdes-general-permits/ncg010000-general-permit-april-2019/download>.
- B. All erosion and sediment control devices and facilities shall be inspected at least once every seven (7) calendar days and within 24 hours after any storm event of greater than one-half inches (0.50") of rain per 24-hour period.

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- C. Stormwater discharges shall be inspected by observation for stormwater discharge characteristics (as listed below) at the frequency specified above to evaluate the effectiveness of the sediment control facilities, devices, or practices. Observations shall be made at all stormwater discharge outfalls and other locations where concentrated stormwater discharges from the site. Observations shall be qualitative; no analytical testing or sampling is required. If any visible sediment is leaving the project site, corrective action shall be taken to reduce the discharge of sediments.
 - 1. Color.
 - 2. Odor.
 - 3. Clarity.
 - 4. Floating solids.
 - 5. Suspended solids.
 - 6. Foam.
 - 7. Oil sheen.
 - 8. Other obvious indicators of stormwater pollution.
- D. The Contractor shall perform and keep records of the above inspections in accordance with the NPDES General Permit No. NCG010000 and all other applicable local requirements. Visible sediment found off the project site, downstream of any stormwater discharges onsite, shall be recorded with a brief explanation of the measures taken to prevent future releases, as well as any measures taken to clean up any sediment that has left the site. This record shall be made available to the Owner, Architect, and governmental authorities.
- E. Product Submittals: The Contractor shall provide specifications for the following manufactured products to be used onsite for erosion and sedimentation control measures, as applicable.
 - 1. Tree Protection Fence.
 - 2. Sediment Fence.
 - 3. Wire Reinforced Silt Fence.
 - 4. Manufactured Inlet Sediment Control Device.
 - 5. Slope & Channel Matting.
 - 6. Skimmer Device (for use in Skimmer Sediment Basin).

1.4 PAYMENT PROCEDURES FOR EROSION CONTROL MEASURES

- A. Establish a line item in the Schedule of Values for Erosion Control Maintenance. This line item shall represent a minimum of thirty percent (30%) of the total value of erosion control for the project.
- B. Erosion control maintenance shall be paid on a monthly basis following the satisfactory installation and maintenance of the erosion control measures.
- C. A performance bond or other financial guarantee, as appropriate, in an amount satisfactory to the Contract or Jurisdictional Authority, shall be provided to cover the restoration of soil erosion and sedimentation control measures which are failing or have failed to contain sediment generated by land-disturbing activities as required by the approved erosion and sedimentation control plan.

1.5 PRODUCT HANDLING

- A. Deliver seed, fertilizer, and other packaged materials in unopened original packages with labels legible and intact. Seed packages shall bear a guaranteed analysis by a recognized authority.
- B. Onsite storage of materials shall be kept to a minimum. Wet or damaged seed or other material shall be removed from the project site immediately.

1.6 PROJECT CONDITIONS

- A. The onsite conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the beginning of project work.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the plan Drawings.
 - 1. Hire a private utility locating company and/or utilize "NC One Call" by calling 1-800-632-4949 prior to the start of work for assistance in locating existing underground utilities.

PART 2 – PRODUCTS

2.1 SOIL AMENDMENTS AND SEED

- A. Temporary Seeding: Planting rapid-growing annual grasses, small grains, or legumes to provide temporary initial cover for erosion control on disturbed areas. Must meet the requirements of Section 6.10 of the NCDEQ Manual.
- B. Permanent Seeding: Refer to Division 32 Section "Lawns and Grasses" for permanent seeding requirements.

2.2 STANDARD EROSION CONTROL PRACTICES

- A. Gravel for Stone Filters: Washed No. 57 stone or as indicated on the Drawings.
- B. Safety Fence: Six foot (6') height chain link fencing with appropriate warning signs posted along the fence.
- C. Silt Fabric: Shall comply with all material specifications of section 6.62 of the NCDEQ Erosion Control Manual.
- D. Filter Fabric (for installation under riprap): Woven geotextile fabric, apparent opening size no larger than US Standard Sieve No. 70; min. grab strength of 120lbs.
- E. Polyacrylamide (PAM) Turbidity Control Log: Solid form PAM product containing blends of water treatment components and polyacrylamide co-polymer for water clarification (25 NTU max. at outlet of sediment basin) and erosion control. Product shall be designed for site-specific soil and water conditions. At a minimum, install logs in drainage structures located immediately upstream of sediment basins and traps. Install additional logs in any other location(s) indicated on the Drawings and per manufacturer's instructions. PAM products shall be APS-700 Series Floc Log by Applied Polymer Systems, Inc. or approved equivalent.
- F. Sediment Fence: Synthetic filter fabric as described in Section 2.2.C of this document, supported by steel posts of 1.33 lb/lf and a minimum length of five feet (5'). Sediment fences shall meet the requirements of Section 6.62 of the NCDEQ Manual.
- G. Wire Reinforced Silt Fence: Synthetic filter fabric as described in Section 2.2.C of this document, supported by steel posts of 1.33 lb/lf, a minimum length of five feet (5'), and a minimum of 14-gauge wire reinforcement with a maximum mesh spacing of six inches (6"). Reinforced silt fences shall meet the requirements of Section 6.62 of the NCDEQ Manual.
- H. Porous Baffles: Porous barriers installed inside a temporary sediment trap, skimmer basin, or sediment basin to reduce the velocity and turbulence of water flowing through the structure and to facilitate the settling of sediment from stormwater runoff before discharge. Baffles shall be constructed of matting made of 100%

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coconut twine woven into high strength matrix, fastened to steel posts of 1.25 lb/lf (min.). Baffle materials and construction must meet the requirements of Section 6.65 of the NCDEQ Manual.

- I. Dewatering Silt Bag: Permeable, non-woven geotextile bag manufactured to accept and filter sediment-laden water pumped from dewatering activities. Silt bag shall be sized as appropriate for the dewatering pump discharge rate and shall be fitted with a fill spout large enough to accommodate the discharge piping of the dewatering pump. Silt bag shall be installed on an undisturbed slope so incoming water flows downhill through the bag without causing erosion. Silt bag shall be Dirtbag, as manufactured by ACF Environmental, Inc. or approved equivalent.
- J. Dewatering Structure: A temporary filtering device used for dewatering operations, complying with the requirements of the NCDEQ Manual.
- K. Construction Entrance: Heavy-duty stone aggregate and filter fabric construction entrance, complying with the requirements of Section 6.06 of the NCDEQ Manual. The water source for washing operations shall be the responsibility of the Contractor.
- L. Riprap: A layer of stone designed to protect and stabilize areas subject to erosion. Provide riprap of the class and quantity indicated on the Drawings. While no specific gradation is required, the various sizes of stone shall be equally distributed within the required size range. The size of an individual stone shall be determined by measuring its long dimension. Stone shall meet the requirements specified in the Drawings for class and size distribution. No more than 5% of the material furnished may be less than the minimum size specified; no more than 10% of the material furnished may exceed the maximum size specified. Stone may be placed by mechanical methods, augmented by hand placing where necessary, provided that when the riprap is completed it forms a properly graded, dense, neat layer of stone. All riprap must meet the requirements of Section 6.15 of the NCDEQ Manual.
- M. Temporary Slope Drain: Tubing or conduit extending temporarily from the top to the bottom of a cut or fill slope. Pipe shall be smooth lined polyethylene, compliant to ASTM 667 or AASHTO M294, and meeting the requirements of Section 6.32 of the NCDEQ Manual.
- N. Skimmer (for use in Sediment Skimmer Basin): A sedimentation basin dewatering control device that withdraws water from the basin's water surface, thus removing the highest quality water for delivery to the uncontrolled environment. Skimmers must meet the requirements of Section 6.64 of the NCDEQ Manual, and shall be installed and maintained in accordance with manufacturer's recommendations to optimize performance and lifespan.
- O. Mulching: Mulching shall be used to prevent erosion and to hold soil and seed in place during the establishment of vegetation. If needed to ensure stabilization of mulch during vegetative growth, tackifiers of the kinds below may be used. All mulching products and installation must meet the requirements of Section 6.14 of the NCDEQ Manual.
 - 1. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturers for slurry application; nontoxic and free of plant-growth or germination inhibitors.
 - 2. Asphalt Emulsion: Material shall be nontoxic and free of plant-growth or germination inhibitors. Emulsified asphalt shall be applied at 10gal/1000sqft.
- P. Windblown Dust Prevention: At a minimum, provide the following to prevent windblown dust.
 - 1. Apply straw mulch and establish temporary or permanent ground cover on exposed soil where work is not being actively performed.
 - 2. Cover or establish vegetative cover on stockpiles.

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3. Apply water or other approved dust suppressant as needed to soil surfaces before they become excessively dry.
4. Sweep and collect soil that has been tracked onto paved surfaces.

2.3 INLET AND OUTLET PROTECTION

- A. **Manufactured Inlet Sediment Control Device:** Storm drainage inlet sediment control devices shall be manufactured from woven polypropylene geotextile to fit the opening of a catch basin or drop inlet for the purpose of filtering sediment from stormwater runoff entering the inlet. The device shall be a High Flow Siltsack as manufactured by ACF Environmental, Inc. or approved equivalent. Install devices in accordance with manufacturer's instructions. The device shall be provided with an integral curb deflector if installed at a catch basin with a vertical opening adjacent to a horizontal grate.
- B. **Hardware Cloth and Gravel Inlet Protection:** Constructed around a drop inlet from wire-mesh hardware cloth around steel posts which supports washed stone. Must meet the requirements of Section 6.51 of the NCDEQ Manual.
- C. **Block and Gravel Inlet Protection:** Constructed around a storm drain inlet of standard concrete block and gravel. Must meet the requirements of Section 6.52 of the NCDEQ Manual.
- D. **Rock Pipe Inlet Protection:** Horseshoe-shaped rock dam structure constructed around a pipe inlet with a sediment storage area around the structure's outer perimeter. Must meet the requirements of Section 6.55 of the NCDEQ Manual. Provide additional sediment storage area if illustrated on plans or details.
- E. **Outlet Protection:** A structure designed to control erosion at the outlet of a channel or conduit. Must meet the requirements of Section 6.41 of the NCDEQ Manual.

2.4 CHANNEL AND SLOPE MATTING

- A. **Slope and Channel Matting:** Erosion Control blankets shall be a machine-produced mat of curled wood fiber (excelsior) or synthetic polypropylene fiber as specified below. Matting shall be used for temporary stabilization during the establishment of seeded cover in all grassed ditches, channels, long slopes, steep banks (6:1 or steeper), and additional areas as indicated on plan Drawings. Matting shall be installed on any area onsite as needed to provide temporary stabilization whether or not matting is indicated on the Drawings. The blanket shall be of consistent thickness with the fiber evenly distributed over the entire area of the mat. The blanket shall be covered with a photo-degradable plastic netting secured to the fiber mat. Slope matting and channel liners shall be excelsior mat unless otherwise indicated on the Drawings, and shall be installed according to the manufacturer's instructions.
 1. **Excelsior Mat (Turf Reinforcement Mat):** Consisting of 80% six inch (6") or longer fiber length, with a consistent width of fibers evenly distributed throughout the mat. Mat shall be smolder resistant with no chemical additives. Mat shall have top and bottom netting of photo-degradable extruded plastic netting, with maximum mesh size of $\frac{3}{4}$ " x $\frac{3}{4}$ ".
 2. **Coconut Mat (Turf Reinforcement Mat):** Consisting of 100% coconut fiber (weighing 0.5lbs/sqyd). Mat shall have a top netting of 100% biodegradable jute (weighing approximately 9.3lbs/1000sqft), and a bottom netting of 100% biodegradable jute (weighing approximately 7.7lbs/1000sqft). C125BN as manufactured by North American Green, or approved equivalent.
 3. **Synthetic Mat:** Consisting of UV-stabilized polypropylene fiber matrix (weighing 0.7lbs/sqyd), with a top netting of extra heavyweight UV-stabilized polypropylene (weighing approximately 5lbs/1000sqft), and a bottom netting of heavyweight UV-stabilized polypropylene (weighing approximately 3lbs/1000sqft). P300 as manufactured by North American Green, or approved equivalent.

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4. Wire Staples: Manufactured of 16-gauge steel wire, with minimum of three inch (3") top and six inch (6") long legs. At a minimum, 1.75 staples are required per square yard of matting.

2.5 CONSTRUCTED EROSION CONTROL PRODUCTS

- A. Diversion Dike: A dike or dike channel constructed along the perimeter of a disturbed construction area. Must meet the requirements of Section 6.22 of the NCDEQ Manual.
- B. Temporary Diversion: A temporary ridge, excavated channel, or combination ridge and channel constructed across sloping land on a predetermined grade. Must meet the requirements of Section 6.20 of the NCDEQ Manual.
- C. Permanent Diversion: A permanent ridge, channel, or combination ridge and channel constructed on a designed grade across sloping land. Must meet the requirements of Section 6.21 of the NCDEQ Manual.
- D. Temporary Sediment Trap: A small, temporary ponding basin formed by an embankment or excavation to capture sediment, constructed to the specifications indicated on the Drawings. Must meet the requirements of Section 6.60 of the NCDEQ Manual.
- E. Sediment Basin: An earthen embankment suitably located to capture sediment, constructed to the specifications indicated on the drawings. Must meet the requirements of Section 6.61 of the NCDEQ Manual.
- F. Skimmer Sediment Basin: An earthen embankment suitably located to capture runoff, equipped with a floating skimmer for dewatering and constructed to the specifications indicated on the Drawings. Must meet the requirements of Section 6.64 of the NCDEQ Manual.
- G. Check Dam: A small, temporary stone dam constructed across a drainage way and placed on filter fabric as described in Section 2.2.D of this document. Must meet the requirements of Section 6.83 of the NCDEQ Manual.

PART 3 – EXECUTION**3.1 GENERAL**

- A. Existing Structures and Facilities
 1. Existing structures, facilities, and water courses shall be protected from sedimentation.
 2. The Contractor shall be responsible for the construction of necessary measures, and all costs shall be at the expense of the Contractor.
 3. Items to be protected from sedimentation deposits shall include, but are not limited to, all downstream property, natural waterways, streams, lakes, and ponds, catch basins, drainage ditches, road gutters, and natural buffer zones.
 4. Control measures such as the erection of silt fences, barriers, dams, or other structures shall begin prior to any land disturbing activity. Additional measures shall be constructed as may be required during the project's construction.
 5. All facilities installed shall be maintained continuously during construction until the disturbed areas are stabilized. Contractor shall remove all erosion control measures at the end of the project at his expense unless otherwise directed by the Owner or his representative.
 6. Perform monitoring and record keeping as specified in this Section.

3.2 INSTALLATION OF EROSION CONTROL MEASURES

- A. Install all erosion and sedimentation control measures in accordance with the plans, specifications, and NCG01 Permit.
- B. Protect all points of construction ingress and egress to the site to prevent tracking of mud onto public streets. Provide temporary construction entrances at all points of access to the site, as appropriate for the project. Provide tire wash station at construction entrance if determined necessary by engineer or NCDENR Environmental Inspector.
- C. Clear only those areas necessary for installation of the perimeter erosion control measures. The balance of the site shall not be cleared or otherwise disturbed until the perimeter erosion control measures are installed, functional, and approved by the NCDENR Environmental Inspector.
- D. Follow the construction sequence and install erosion control measures as indicated on the Drawings and as directed by the NCDENR Environmental Inspector.
- E. Install additional measures as necessary to prevent sediment from leaving the project site.

3.3 MAINTENANCE OF EROSION CONTROL MEASURES

- A. Maintain all erosion and sedimentation control measures according to the requirements of the NCDEQ Manual and any applicable local requirements.
- B. At a minimum, the following maintenance is required:
 - 1. Temporary Seeding
 - a. Re-seed and mulch areas where cover is inadequate to protect against erosion until adequate cover is obtained.
 - 2. Safety Fence
 - a. Review fence regularly for damage. Repair any noted damage immediately.
 - b. Secure the fence at the end of each working day. Repair or replace all locking devices as necessary.
 - 3. Polyacrylamide (PAM) Turbidity Control Log
 - a. Check logs regularly and replace as needed throughout the duration of construction to maintain effective erosion control.
 - 4. Sediment Fence
 - a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall.
 - b. Make any required repairs immediately. Give special attention to damage resulting from end-runs and undercutting.
 - c. Replace fabric that is decomposing or otherwise ineffective.
 - d. Clean out accumulated sediment following every storm event and as needed to prevent sediment accumulation higher than one-half the height of the barrier.
 - 5. Wire Reinforced Silt Fence
 - a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall.
 - b. Make any required repairs immediately. Give special attention to damage resulting from end-runs and undercutting.
 - c. Replace fabric that is decomposing or otherwise ineffective.

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- d. Clean out accumulated sediment following every storm event and as needed to prevent sediment accumulation higher than one-half the height of the barrier.
- 6. Porous Baffles
 - a. Inspect baffles at least once weekly and following every storm event. Make any required repairs immediately.
 - b. Replace baffle fabric immediately if it collapses, tears, decomposes, or becomes otherwise ineffective.
 - c. Clean out baffles when sediment deposits reach one-half the height of the baffle. If damaged during cleanout, replace material immediately.
- 7. Dewatering Silt Bag
 - a. Remove and replace silt bag when device no longer drains efficiently due to sediment accumulated in the bag.
- 8. Dewatering Structure
 - a. Repair or replace the filtering media as needed to prevent sediment accumulation from affecting the filtering capacity of the structure.
- 9. Construction Entrance
 - a. Wash and rework stone and/or place additional stone as required to prevent tracking of mud onto the roadways.
 - b. Clean out the sediment-trapping device for the washrack.
 - c. Remove all materials spilled, dropped, washed, or otherwise tracked onto roadways or into storm sewers immediately. Do not use water trucks to wash the roadways.
- 10. Riprap
 - a. Inspect riprap following every storm event. Re-lay riprap as necessary to ensure proper discharge dispersal around and under the riprap.
 - b. Clean out accumulated sediment from the riprap.
- 11. Temporary Slope Drain
 - a. Inspect temporary slope drains weekly and following every storm event. Immediately make any repairs necessary to ensure a free flow through the pipe.
- 12. Manufactured Inlet Sediment Control Device
 - a. Remove, empty, clean, and replace the device as needed during construction. Empty collected sediment in approved, protected location. Remove and dispose of device following full and permanent stabilization of the contributing drainage area.
- 13. Hardware Cloth and Gravel Inlet Protection
 - a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall.
 - b. Remove and clean or replace stone filters that have been clogged with sediment. Make any required repairs immediately.
 - c. Remove accumulated sediment as required. Do not allow sediment to accumulate higher than one-half the height of the measure.
- 14. Block and Gravel Inlet Protection
 - a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall.
 - b. Remove and clean or replace stone filters that have been clogged with sediment. Make any required repairs immediately.

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- c. Remove accumulated sediment as required. Do not allow sediment to accumulate higher than one-half the height of the measure.
- 15. Rock Pipe Inlet Protection
 - a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall.
 - b. Remove and clean or replace stone filters that have been clogged with sediment. Make any required repairs immediately.
 - c. Remove accumulated sediment as required. Do not allow sediment to accumulate higher than one-half the height of the structure.
- 16. Outlet Protection
 - a. Inspect outlet protection following every storm event. Re-lay riprap as necessary to ensure proper discharge dispersal across the outlet protection.
- 17. Diversion Dike
 - a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall. Inspect at least once every two weeks, whether or not it has rained. Make any necessary repairs immediately.
 - b. Repair any damage caused by construction activities by the end of each working day.
- 18. Temporary Diversion
 - a. Assess temporary diversion(s) at the end of each working day to ensure effective operation.
- 19. Permanent Diversion
 - a. Inspect diversion(s) following every rainfall and at least once every two weeks.
 - b. Remove accumulated sediment and make repairs as necessary.
 - c. Re-seed as necessary to maintain vegetative cover.
- 20. Temporary Sediment Trap
 - a. Remove sediment and restore the trap to its original dimensions once sediment accumulates to the cleanout level. Refer to plan Drawings for appropriate cleanout level elevations.
 - b. Any dewatering shall be pumped and discharged through an approved dewatering structure.
 - c. Remove and clean or replace storm choked with sediment.
 - d. Regularly inspect the structure to ensure that it is structurally sound. Immediately repair any damage discovered.
- 21. Sediment Basin
 - a. Remove sediment and restore the basin to its original dimensions once sediment accumulates to the cleanout level. Refer to plan Drawings for appropriate cleanout level elevations.
 - b. Any dewatering shall be pumped and discharged through an approved dewatering structure.
 - c. Regularly inspect the principal spillway and outfall for proper function, and the emergency spillway to ensure that its lining is well-established and erosion resistant. Immediately repair any damage discovered.
 - d. Regularly assess the embankment to ensure that it is structurally sound. Immediately repair any damage discovered.
- 22. Skimmer Sediment Basin
 - a. Inspect skimmer sediment basin(s) at least once weekly and after each rainfall event and repair any damage immediately.

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- b. Remove sediment from entire basin and restore the basin to its original dimensions when sediment accumulates to one-half the height of the first baffle. Pull the skimmer to one side so the sediment underneath can be excavated.
- c. If baffles are damaged, repair them immediately. Re-anchor the baffles if water is flowing around or underneath them.
- d. Ensure that the skimmer is not clogged with trash or debris to allow adequate discharge flow. Maintain skimmer in accordance with manufacturer's instructions.

23. Check Dam

- a. Inspect immediately following each rainfall and at least once daily during prolonged rainfall.
 - b. Remove and clean or replace stone that has been clogged with sediment.
 - c. Inspect dam for evidence of by-pass flows. Make any required repairs immediately.
 - d. Remove accumulated sediment as required. Do not allow sediment to accumulate higher than one-half the height of the dam.
- C. Remove accumulated sediment as required and at appropriate intervals to maintain effective function of all erosion control measures.
- D. Inspect, repair, and remove accumulated sediment from erosion control measures following significant (greater than 0.50") rainfall events.
- E. If erosion control measures become clogged, causing the impoundment of water, restore the measures immediately. Poned water poses a potential drowning hazard and shall be relieved immediately, either by pumping (through an approved dewatering structure) or by removal of the blockage.

3.4 SITE STABILIZATION

- A. Permanently protect stabilized areas prior to the removal of protective devices. After the final establishment of permanent stabilization is provided and inspected by NCDENR, remove temporary erosion and sediment control measures. Re-spread accumulated sediments as specified. Permanently stabilize all areas disturbed by the removal and re-spreading operations immediately.
- B. Build all Constructed Erosion Control Products as shown on Drawings and per NCDEQ Manual. Maintain during construction to keep erosion and sedimentation to a minimum. When it is necessary to remove any of these measures, return the areas to required profiles and condition before establishing final stabilization.
- C. Temporary Seeding: Seed disturbed areas in accordance with the plan Drawings, NCG01 Permit Requirements and per Section 6.10 of the NCDEQ Manual.
- D. Permanent Seeding: Establish permanent vegetative cover in accordance with the schedule provided by the plan Drawings and Division 32 Section "Lawns and Grasses".
- E. Mulching and Matting: Apply mulch or matting to retain soil and grass. Mulch areas with a slope greater than five percent (5%) by spreading a light cover of mulch over seeded area at the rate of not less than 95 lbs/1000sqft. Install temporary matting in all grassed ditches, channels, long slopes, steep banks (6:1 or steeper), and additional areas indicated on plans or where extra protection from erosion is needed.

3.5 REMOVAL OF EROSION CONTROL MEASURES

- A. Remove all temporary erosion control measures following the stabilization of the site. Do not remove erosion control measures until authorized by the NCDENR Environmental Inspector.

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- B. Coordinate final inspection with Engineer and NCDENR. Provide final inspection report to Owner and Engineer for permit closeout.
- C. Once permit closeout has been completed, remove all temporary erosion and sedimentation control measures, then topsoil, permanently seed, and stabilize areas occupied by erosion control measures.

END OF SECTION 31 2500

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

- A. This Section includes soil treatment for termite control.

1.3 SUBMITTALS

- A. Product data and application instructions.
- B. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.4 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.
- B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.
- C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.5 JOB CONDITIONS

- A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.
- B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 WARRANTY

- A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- B. Warranty Period: 5 years from date of Final Acceptance. Also, include a renewable warranty for the Owner's future consideration.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION:

- A. Use an emusible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of the following chemical elements and concentrations:
 - 1. Cypermethrin (Demon TC) 0.5% in water emulsion.
- B. Other solutions may be used as recommended by Applicator and if acceptable to local governing authorities. Use only soil treatment solutions that are not injurious to planting.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.
- B. Application Rates: Apply soil treatment solution as follows:
 - 1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:
 - a) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.
 - b) Apply 1 gallon of chemical solution per 10 sq. ft. (4.1 L of chemical solution per sq. m) as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallon of chemical solution per 10 sq. ft. (6.1 L of chemical solution per sq. m) to areas where fill is washed gravel or other coarse absorbent material.
 - c) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) of trench for each 12 inches (300 mm) of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches (150 to 200 mm) wide along outside of foundation to a depth of not less than 12 inches (300 mm). Punch holes to top of footing at not more than 12 inches (300 mm) o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.
 - 2. At hollow masonry foundations or grade beams, treat voids at rate of 2 gallons per 10 linear feet 2.6 L per meter, poured directly into the hollow spaces.
 - 3. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gallons per 10 linear feet (5.1 L per linear m) of penetration.
- C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.
- D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

- E. Allow not less than 12 hours drying time after application before beginning concrete placement or other construction activities.

END OF SECTION 31 3116

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Existing Conditions: Using photographs and/or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.
 - 1. Perform and submit video of interior of gravity sewer pipes adjacent to the work before and after construction.
- D. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.4 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Architect's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.

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1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

1.5 PROJECT CONDITIONS

- A. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
 1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
 4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 FIELD QUALITY CONTROL

- A. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- B. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.3 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
 - 1. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
 - 2. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes provisions for hot-mixed asphalt paving over prepared subbase.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements of NCDOT "Standard Specifications for Roads and Structures".
- C. Job Mix Formula: Provide Geotechnical consultant with two copies of the proposed job mix formula at least ten days prior to beginning work. This formula shall be approved by NCDOT for the type of pavement specified.
- D. Recycled Content: All asphalt mixes shall include no more than 40% recycled asphalt product (RAP). Asphalt mix may contain up to 6% recycled asphalt shingles (RAS) in which case maximum RAP is 30%.

1.4 SITE CONDITIONS

- A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- B. Construct hot-mixed asphalt surface course when the minimum surface and air temperature is above 50 deg F and when base is dry. Base course may be placed when air temperature is above 40 deg F and rising.
- C. Grade Control: Establish and maintain required lines and elevations shown on the drawings.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of the latest version of the following standards, except where more stringent requirements are indicated:
 - 1. All materials, construction methods and testing shall comply with the requirements of the latest editions of the North Carolina Department of Transportation (NCDOT) "Standard Specifications for Roads and Structures" and the NCDOT "Asphalt Quality Management System".
- B. All work within any NCDOT right-of-way shall conform to the provisions and conditions of the NCDOT encroachment agreement(s) and driveway permit(s) and other applicable NCDOT standards and policies. The encroachment agreement(s) and driveway permit(s) are considered part of the project specifications by reference. Copies of the agreement(s) and permit(s) will be provided upon request from the Architect.

1.6 PROJECT CONDITIONS

- A. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use locally available materials and gradations that comply with the requirements of the latest version of the NCDOT "Standard Specifications for Roads and Structures" and NCDOT "Asphalt Quality Management System" and exhibit a satisfactory record of installations.
- B. Aggregate Base Course (ABC): Type A aggregate base course meeting the requirements of the latest version of NCDOT "Standard Specifications for Roads and Structures" and NCDOT "Asphalt Quality Management System".
- C. Superpave Asphalt Paving Mix: Superpave base, intermediate and surface asphalt paving mix meeting the requirements of the latest version of NCDOT "Standard Specifications for Roads and Structures" and NCDOT "Asphalt Quality Management System". Types as indicated on the drawings.
- D. Tack Coat: Asphalt material meeting the requirement of the latest version of NCDOT "Standard Specifications for Roads and Structures" and NCDOT "Asphalt Quality Management System".
- E. Marking Paint: Thermoplastic Alkyd/Maleic and Hydrocarbon type, meeting the requirements of Section 1087 of NCDOT "Standard Specifications for Roads and Structures."
 - 1. Color: As indicated on the drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. General: Remove loose material from compacted subbase surface immediately before applying prime coat.
- B. Proof-roll prepared subgrade surface as described in Division 31 Section "Earth Moving" to check for unstable areas and areas requiring additional compaction.
- C. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- D. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into hot-mixed asphalt pavement. Distribute at a rate of 0.05 to 0.15 gallons per sq. yd. of surface.
- E. Allow to dry until at proper condition to receive paving.
- F. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.
- G. Cold mill surfaces of existing pavements to a minimum depth of 1.5-inches at longitudinal terminus of asphalt overlays for a minimum width of 10 feet (extend terminus milling width to 100-ft on public roads) and at horizontal terminus (including along gutter line of existing curbs adjacent to asphalt overlays) for a minimum width of 6 feet to allow a smooth transition from full-depth thickness of overlay course to existing pavement or gutter surface. Thoroughly remove all loose material from milled surface before placing tack coat.
- H. Cold mill surfaces of existing pavements to required depths at edges of asphalt wedge sections on public roads for widths needed to allow minimum depth thickness of wedge course. Thoroughly remove all loose material from milled surface before placing tack coat.
- I. Place aggregate base courses as specified in Section 31 20 00 "Earth Moving".

3.2 PLACING MIX

- A. Limitations: Do not produce or place asphalt mixtures during rainy weather, when the subgrade or base course is frozen, or when the moisture on the surface to be paved would prevent proper bond. Comply with all NCDOT weather and temperature limitations.
- B. General: Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 225 deg F. Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.
- C. Paver Placing: Place in strips not less than 10 feet wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

- D. Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.
- E. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

3.3 ROLLING

- A. General: Begin rolling when mixture will bear roller weight without excessive displacement.
- B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.
- D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.
- E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained required density. Compact the asphalt to at least the minimum percentage of the maximum specific gravity listed below unless otherwise allowed by NCDOT.
 - 1. S-9.5B (2018): 90% of Maximum Specific Gravity. (Or as specified in latest NCDOT QMS Manual)
 - 2. Other mixes as specified in latest adopted NCDOT QMS Manual.
- F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 TRAFFIC MARKINGS

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Materials: Use thermoplastic marking for all pavement markings.
- C. Apply traffic paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.5 FIELD QUALITY CONTROL

- A. General: Testing of asphalt concrete mix and in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory in

accordance with Division 01 Section "Quality Control." Repair or remove and replace unacceptable paving as directed by Architect.

1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from the specified requirements.
- B. Thickness: In-place compacted thickness shall be tested in accordance with ASTM D 3549. Results shall be considered unacceptable if less than the thickness specified on the drawings.
- C. Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10 feet straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:
 1. Base Course Surface: 1/4 inch.
 2. Wearing Course Surface: 3/16 inch.
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1,000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements as directed by engineer or architect.
- F. Repair all test core holes with full depth asphalt patch, regardless of patching performed by the testing agent hired by the owner. If the testing agent hired by the owner installed a grouted patch, consult with the civil engineer if repatching core holes is needed.
- G. Perform ponding water tests. Repair areas of pavement that pond water as directed by civil engineer or architect.
- H. Check surface areas at intervals as directed by the civil engineer and/or Architect.

END OF SECTION 32 12 16

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior portland cement concrete paving for the following:
 - 1. Curbs and gutters, pavement, walkways, service court, dumpster pads.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading and subbase course.
 - 2. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 3. Division 07 Section "Sealants and Caulking" for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Design mixes for each class of concrete. Include percentage of recycled content (20% maximum). Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.4 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the latest version of the following standards, except where more stringent requirements are indicated.
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 2. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

1.5 PROJECT CONDITIONS

- A. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

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. 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.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- D. Plain Steel Wire: ASTM A 82, as drawn.
- E. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

- F. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, portland cement, Type I, II, or III.
 - a. Fly Ash: ASTM C 618, Class F. 20% by weight of required cement content, with 1.2-lbs Fly Ash per 1-lb of cement replaced.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120 with 1-lb slag per 1-lb of cement replaced.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate, uniformly graded. Provide aggregates from a single source[with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials].
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M, potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Available Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edeco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, ChemRex Inc.; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation; Finishing Aid.
 - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 1. Available Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoko; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation; Resi-Chem Clear.
 - m. Tamms Industries Inc.; Horncure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.6 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate.
 1. Dowels: Galvanized steel, diameter of $\frac{3}{4}$ inch, minimum length 10 inches.. Dowels shall be recessed 1" below top of wheel stop.
- C. Slip Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

- D. Bonding Agent: ASTM C 1059, Acrylic or styrene butadiene.
- E. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.
- F. Pigment Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. Available Products:
 - a. Conspec Marketing & Manufacturing Co., Inc.; Conshake 600 Colortone.
 - b. Dayton Superior Corporation; Quartz Tuff.
 - c. Euclid Chemical Company (The); Surfex.
 - d. Lambert Corporation; Colorhard.
 - e. L&M Construction Chemicals, Inc.; Quartz Plate FF.
 - f. MBT Protection and Repair, ChemRex Inc.; Mastercron.
 - g. Metalcrete Industries; Floor Quartz.
 - h. Scofield, L. M. Company; Lithochrome Color Hardener.
 - i. Symons Corporation; Hard Top.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi, 3500 psi, or 3000 psi as indicated on the drawings.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: As specified by NCDOT Standard Specifications for class of concrete indicated.
 - 3. Slump Limit: Maximum 3.5 inches for non-vibrated, maximum 4 inches for vibrated.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 - 2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 - 3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use admixtures in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
 - 1. Fly Ash: 20 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.

3. Combined Fly Ash, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash not exceeding 20 percent.
- F. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd..
- G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

2.9 JOINT SEALANTS

- A. A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- B. B. Round Backer Rod for Cold-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and pavement bottom-side adhesion of sealant.

2.10 DETECTABLE WARNING SURFACE TILES

- A. A. Tiles shall be designed to be cast-in-place within concrete pavement or sidewalks in compliance with ADA and ANSI requirements. Tiles shall be manufactured using matte finish exterior grade glass and carbon reinforced polyester based Sheet Molding Compound composite material with truncated domes containing fiberglass reinforcement. Tiles may also be manufactured of an epoxy polymer composition with an ultra-violet stabilized coating.
 1. Color: Tiles shall be homogeneous in color and shall be Federal Yellow unless noted otherwise.
 2. Domes: Domes shall meet the spacing and dimensional requirements of section 705.5 of ANSI A117.1 and shall be compliant with ADA requirements.
- B. B. Tiles shall be as manufactured by ADA Solutions, Inc., Armor-Tile by Engineered Plastics, Inc, or approved equal.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase.
- D. Place aggregate base courses as specified in Division 31 Section "Earth Moving".

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as indicated below unless shown otherwise on Drawings. Construct contraction joints for a depth equal to at least 1/3 of the concrete thickness, as follows:
1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
 3. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
 4. Spacing: Locate contraction joints at 10-ft max. intervals, each way in concrete pavement; 5-ft max. intervals, each way in concrete sidewalks/patios unless shown otherwise. Locate contraction joints in sidewalks less than 8-ft in width at 5-ft intervals across the walk. Locate contraction joints in sidewalks of 8-ft and greater width at 5-ft intervals across the walk and equally section the walk lengthwise with joints at 5-ft. max. intervals (example: an 8-ft wide walk shall have contraction joints at 5-ft. spacing across the walk and one joint dividing the walk lengthwise into two, equal 4-ft sections.)
- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 2. Provide tie bars at sides of paving strips where indicated.
 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. Isolation (expansion) Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints in curbs and sidewalks at intervals of 30 feet, each way, unless indicated otherwise.
 2. Extend joint fillers full width and depth of joint 1/2 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Ensure forms are set to ensure water will not pond on final surface.

- B. Remove snow, ice, or frost from base surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- H. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.
- J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
- K. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- L. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control

temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

- M. Detectable Warning Surface Tiles: Install tiles in accordance with manufacturer's instructions in locations indicated on the plans and details. Set tiles in concrete or mortar base with mortar joints. Sand base and joints will not be allowed.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots to ensure positive drainage and eliminate ponding. Refloat surface immediately to a uniform granular texture.
1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across all site concrete sidewalk and pavement surfaces perpendicular to line of traffic to provide a uniform fine line texture finish.
 2. Very Fine Textured Broom Finish: Draw a very fine soft bristle broom across all concrete Play Area and Basketball Court surfaces perpendicular to direction of play to provide a uniform fine line texture finish for concrete.
- B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to a radius of 1/4-inch unless indicated otherwise on the drawings. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
- C. Step Tread Grooves: Tool three (3) parallel grooves along entire top front edge of new concrete stair treads.
- D. Colored Stamped Pattern Finish: After initial floating, apply dry-shake materials to pavement surface according to manufacturer's written instructions. Embed color materials by power floating. After final floating, apply stamped pattern in pavement surface. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.
1. Stamped Pattern: 8"x 4" "brick" in patterns as shown on drawings.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 FIELD QUALITY CONTROL TESTING

- A. The Owner shall employ an independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement in accordance with Division 01 Section "Quality Control" and as follows:
1. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 2. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within one week of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of

concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Final Acceptance inspections.
- E. Remove and replace concrete paving or curb and gutter that ponds water.

END OF SECTION 32 1313

SECTION 321700 - PAVEMENT MARKINGS, SIGNS AND SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

- A. This Section includes, but is not limited to, the following:
 - 1. Establishing the location of pavement markings and applying pavement markings for parking space lines, traffic control, fire lane and accessible spaces.

1.3 QUALITY ASSURANCE

- A. All work and materials shall conform to the requirements of the latest edition of the North Carolina Department of Transportation (NCDOT) Standard Specifications for Roads and Structures.
- B. All materials for signs shall conform to the requirements of the latest edition of the North Carolina Department of Transportation (NCDOT) Standard Specifications for Roads and Structures (and to the requirements of the latest edition of the Manual of Uniform Traffic Control Devices for traffic signs).
- C. Installer Qualifications: Engage an experienced installer, who has successfully completed striping and signage projects similar in size and complexity to this project. Installer shall have a minimum of 5-years' experience and installer's primary business (defined as a minimum of 60% of total billings) shall be striping and/or signage.

1.4 SUBMITTALS

- A. Product Data and written confirmation that the following materials are included on NCDOT's list of approved construction materials:
 - 1. Pavement marking materials
 - 2. Pavement marking installers experience with thermoplastic installation and installers Type 3 Material Certification and Type 4 Material Certification.

PART 2 - PRODUCTS

2.1 PAVEMENT MARKING PAINT AND GLASS BEADS

- A. Thermoplastic lane markings with glass beads per NCDOT 2018 Standard Specification Section 1087.
- B. Curb painting color along fire lanes and cross walks shall be yellow, unless otherwise indicated.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION FOR PAVEMENT MARKING

- A. Per NCDOT 2018 Standard Specification Section 1087

3.2 APPLICATION OF PAVEMENT MARKING AND GLASS BEADS

- A. Apply paint in accordance with the requirements of the NCDOT 2018 Standard Specification Section 1087
- B. Lay out lines and markings to the width and length as indicated. All parking space lines shall be 4 inches wide.
- C. Apply paint with an approved paint applicator.
- D. Apply paint at manufacturer recommended rates.

END OF SECTION 321700

SECTION 323113 –CHAIN-LINK FENCES AND GATES (PVC CLAD)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract Documents apply to the work of this Section.

1.2 WORK INCLUDED

- A. Polyvinyl Chloride (PVC) clad chain link fence and gates

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for fencing, fabric, gates and accessories.
- B. Shop Drawings: Submit shop drawings indicating location of fence (with dimensions), height, post locations, details of post installation, gate swing, hardware and accessories. Identify PVC touch up paint.
- C. Samples: None required

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates indicated in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. PVC Coated Steel Fencing and Fabric:
 - a) Colorguard Fence Products, Inc.
 - b) American Chain Link Fence Company
 - c) Semmerling Fence & Supply, Inc.

d) Anchor Fence, Inc.

2.2 FABRIC:

- A. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLMFI) Product Manual. Provide one-piece fabric widths. Wire size includes zinc coating.
- B. Size: 2-inch diamond mesh, 9-gauge (0.148-inch diameter) wire.
- C. PVC Coating: ASTM F668, Class 2B (fused and adhered) PVC coating, black color. Bonded or extruded & glued fabric may not be used.
- D. Selvage shall be twisted at the top and bottom.

2.3 FRAMING:

- A. Strength requirements for posts and rails shall conform to ASTM F 669.
- B. Pipe shall be straight, true to section, material and sizes specified.
- C. Steel Framework, General: Posts, rails, braces and gate frames.
 - 1. Type II Pipe: Manufactured from steel conforming to ASTM A 569 or A 446, grade D, cold formed, electric welded with minimum yield strength of 50,000 p.s.i. and triple coated with minimum 0.9 oz. Zinc per square foot after welding, a chromatic conversion coating and a clear polymer overcoat. Corrosion protection on inside surfaces shall protect the metal from corrosion when subjected to the salt spray test of ASTM B 117 for 300 hours with the end point of 5% Red Rust.
 - 2. PVC-Coating finish: In accordance with ASTM F668, Class 2B (fused and adhered) apply supplemental color coating of 10 to 15 mils (0.254 – 0.38mm) of thermally fused PVC in color to match fabric.
- D. End, Corner and Pull Posts:
 - 1. For fabric height up to 6' - 2.375" OD Type II steel pipe (3.12 lb/ft).
 - 2. For fabric height over 6' - 2.875" OD Type II steel pipe.(4.64 lb/ft).
- E. Line Posts:
 - 1. For fabric height up to 6' - 1.90" OD Type II steel pipe (2.28 lb/ft).
 - 2. For fabric height over 6' - 2.375" OD Type II steel pipe (3.65 lb/ft).
- F. Gate Posts:
 - 1. Provide posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
 - a) 6' or Under: 2.875" OD Type II steel pipe (4.64lb/ft).
 - b) Over 6': 4.000" OD Type II steel pipe (8.65 lb/ft).
- G. Top & Bottom Rail:
 - 1. Manufacturer's longest lengths, with expansion-type couplings, approximately 6" long, for each joint. Provide means for attaching rail securely to each gate corner, pull, & end post.
 - a) 1-1/4" NPS (1.66" OD) Type II steel pipe.
- H. Intermediate and/or Center Rail:
 - 1. Same material as top rail. Manufacturer's standard galvanized steel cap required for each end.

2.4 FITTINGS AND ACCESSORIES:

- A. Material: Comply with ASTM F 626. Mill finished galvanized steel, to suit manufacturer's standards.
 - 1. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights indicated.
 - 2. Supplemental Color Coating: In accordance with ASTM F668, Class 2B (fused and adhered), apply supplemental color coating of 10 to 15 mils (0.254 – 0.38mm) of thermally fused PVC in color to match fabric. Apply to exterior surfaces and, except inside cap shapes, to exposed interior surfaces. Color to match chain link fabric.
- B. Tension Wire: 7 gauge (0.177" diameter) metallic coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.
 - 1. PVC-Coated finish: In accordance with ASTM F668, Class 2B (fused and adhered), apply supplemental color coating of 10 to 15 mils (0.254 – 0.38mm) of thermally fused PVC in color to match fabric.
- C. Wire Ties:
 - 1. 9 gauge [0.148" (3.76mm)] galvanized steel wire for attachment of fabric to line posts.
 - 2. Double wrap 13 gauge [0.092" (2.324mm)] for rails and braces.
 - 3. Hog ring ties of 12-1/2 gauge [0.0985" (2.502mm)] for attachment of fabric to tension wire
- D. Post Brace Assembly:
 - 1. Manufacturer's standard adjustable brace at end of gate posts and at both sides of corner and pull posts, with horizontal brace located at mid height of fabric. Provide same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener. Manufacturer's standard galvanized steel cap required for each end.
- E. Post and Line Caps: Weathertight closure cap required for each post. If top rail is required, use line post caps with loop.
- F. Tension or Stretcher Bars: Hot-dip galvanized steel with minimum length 2" less than full height of fabric, minimum cross section of 3/16" by 3/4" and minimum 1.2 oz. zinc coating per sq. ft. of surface area. One bar is required for each gate and end post and two for each corner and pull post, except where fabric is integrally woven into post.
- G. Tension and Brace Bands: Minimum 3/4" wide hot-dip galvanized steel with minimum 1.2 oz. zinc coating per sq. ft. of surface area.
 - 1. Tension bands: Minimum 14 gauge (0.074") thick.
 - 2. Tension and Brace bands: Minimum 12 gauge (0.105") thick.
- H. Nuts and bolts shall be galvanized but not vinyl coated. Provide touch up paint and color coat nuts and bolts to match fabric.

2.5 POST SETTING MATERIALS

- A. Comply with the requirements for NCDOT Class A, 3000 psi concrete.

2.6 GATES:

- A. Fabrication:
 - 1. Fabricate perimeter frames of gates from metal and finish to match fence framework. Utilize Fusion or stainless steel welded connections to form a rigid one-piece unit. Assemble gate frames by welding, providing security against removal or breakage connections. Provide horizontal and vertical members

- to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8' apart unless otherwise indicated.
2. Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher hooks to gate frame at not more than 15" o.c.
 3. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
- B. Swing Gates: Comply with ASTM F 900.
1. Fabricate perimeter frames of minimum 1.90" OD Type II steel pipe.
- C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:
1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degrees gate opening. Provide 1-1/2 pair of hinges for each leaf over 6' nominal height.
 2. Latch: Forked type to permit operation from either side of gate, with padlock eye as integral part of latch.
 3. Keeper: Provide keeper that automatically engages gate leaf and holds it in open position until manually released.
 4. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Ensure plunger bar cannot be removed without tools. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
 5. Hardware materials: Provide hot dipped galvanized steel or malleable iron shapes to suit gate size. Field coat hardware parts (e.g. hinges, latch, keeper and drop bar) with PVC touch up paint, provided by manufacturer, to match adjacent finishes.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install fence in compliance with ASTM F 567 and manufacturers recommendations. Do not begin installation and erection before final grading is completed, unless otherwise permitted. Apply fabric to outside of framework, unless otherwise indicated.
- B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more, or as indicated on plans.
- C. Excavation:
1. Drill or hand excavate (using post hole digger) holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
 2. Holes in asphalt or concrete surfaces will be cut by core-drilling with a bit of diameter at least equal to the required hole diameter. Holes in concrete may be formed prior to placing concrete.
 3. Excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
 4. Excavate hole to depths approximately 6" lower than post bottom, with bottom of posts set not less than 40" below finish grade surface.
- D. Setting Posts:

1. Space 10' o.c. maximum, unless otherwise indicated.
 2. Center and align posts in hole, 6" above bottom of excavation.
 3. Protect portions of concrete posts above ground from concrete splatter. Place concrete around post and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 4. Extend concrete above grade and slope all around (dome) to allow for drainage away from post. Uniformly and neatly texture the concrete surface with a broom finish. Remove any spilled or splashed concrete from the post and surrounding area immediately.
- E. Top Rails:
1. Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
- F. Center Rails:
1. Install in one place between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary. Provide center rails for fence 12' or taller, or as indicated on drawings.
- G. Bottom Rails:
1. Install in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings when necessary.
- H. Brace Assemblies:
1. Install braces so posts are plumb when diagonal rod is under proper tension.
- I. Top and Bottom Tension Wire:
1. Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than same gauge and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire, using 11 - ga. galvanized steel hog rings spaced maximum 24" o.c. Install where top and/or bottom rails are not specified on plans.
- J. Fabric:
1. Leave approximately 2" between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails and tension wires. Attach fabric with wire ties to line posts at 12"-15" (381mm) o.c. and to rails, braces, and tension wire at 24" (600 mm) o.c. Install fabric on security side of fence, unless otherwise indicated, and anchor to framework so that fabric remains in tension after pulling force is released.
 2. For athletic field fencing, install fabric on the field side of the fence unless otherwise indicated.
- K. Stretcher Bars:
1. Thread through fabric 4" o.c., and secure to end, corner, pull and gate posts with tension bands spaced maximum 15" o.c.
- L. Accessories
1. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
- M. Fasteners:
1. Install nuts for tension bands and hardware bolts on site of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

N. Gates:

1. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.2 FINISHING

- A. Remove and replace sections of fence and fittings with damaged PVC coating. Minor aesthetic damage may be touched up with a suitable spray on material provided by the manufacturer.
- B. Clean up debris and unused material and remove from the site.

END OF SECTION 32 3113.19

SECTION 329200 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fine grading and preparing lawn areas (including courtyards)
 - 2. Topsoil Placement
 - 3. Soil amendments
 - 4. Fertilizers
 - 5. Seeding
 - 6. Hydroseeding

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Lawns: All areas disturbed by construction and not otherwise covered by paving, buildings or other structures. Excluding athletic fields. (See Specification 02921)

1.4 SUBMITTALS

- A. Certification by product manufacturer that the following products supplied comply with requirements:
 - 1. Grass Seed
 - a. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - b. Blue tag certification for each bag of seed.
- B. Installers qualifications
 - 1. Provide a list, with references, of the past three projects of a similar magnitude.
- C. Topsoil Amendment Plan.
 - 1. Provide copy of topsoil testing report.
 - 2. List of amendments proposed for topsoil, including application rates.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer, who has successfully completed lawn establishment projects similar in size and complexity to this project. The installer's primary business (defined as a minimum of 60% of total billings) shall be establishment of lawns.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 COORDINATION AND SCHEDULING

- A. Planting Season: Sow lawn seed during normal planting seasons for type of lawn work required:
 - 1. Bermuda Grass Lawn Areas: April 15- August 15
- B. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work.
- C. Lawn Seeding Schedule
 - 1. Refer to the drawings for early seeding requirements for specified lawn areas.
 - 2. If job completion schedule does not allow seeding within a normal planting season, provide interim temporary seeding necessary to stabilize site. Complete permanent seeding during the next planting season.

1.8 LIMITS OF SEEDING

- A. Spread topsoil and seed lawn areas. Hydroseed all slopes greater than 3:1.

1.9 PAYMENT PROCEDURES FOR LAWNS AND GRASSES

- A. Establish a line item in the Schedule of Values for Lawn Maintenance. This line item shall represent a minimum of thirty percent (30%) of the total value of the seeding for the project.
- B. Lawn maintenance will be paid on a monthly basis, following the satisfactory maintenance of the lawns.

PART 2 – PRODUCTS

2.1 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1" or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

- B. Have topsoil tested by a certified soil testing laboratory to determine the type and quantity of soil amendments necessary. Add amendments to topsoil as necessary to meet these requirements.

2.2 INORGANIC SOIL AMENDMENTS

- A. If the topsoil analysis indicates the need for inorganic soil amendments, the following standards apply:
- B. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36-mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Provide lime in form of dolomitic limestone.
- C. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
- D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- E. Aluminum Sulfate: Commercial grade, unadulterated.
- F. Perlite: Horticultural perlite, soil amendment grade.
- G. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- H. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- I. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- J. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

- A. If the topsoil analysis indicates the need for organic soil amendments, the following standards apply:
- B. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
 - 3. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
 - 4. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 5. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.4 HERBICIDES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.5 FERTILIZER

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in topsoil analysis reports from a qualified soil-testing agency.
 - 2. Minimum Composition: No less than 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2.6 SEED

- A. Grass Seed: All grass seed must be fresh, clean, and dry.
- B. Seed Species
 - 1. Hulled Sunstar or Riviera Bermuda applied at 200 lbs/acre
 - a. Quality:
 - i. Seed type shall be as listed below for solar exposure and shall bear an official "NC Certified Seed" label. Tags must be attached to each bag delivered on site.
 - ii. Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - b. Full Sun:
 - i. 80 percent Bermudagrass (*Cynodon dactylon*).
 - c. Sun and Partial Shade: Proportioned by weight as follows:
 - i. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - ii. 30 percent chewings red fescue (*Festuca rubra* variety).
 - iii. 10 percent perennial ryegrass (*Lolium perenne*).
 - iv. 10 percent redtop (*Agrostis alba*).
 - d. Shade: Proportioned by weight as follows:
 - i. 50 percent chewings red fescue (*Festuca rubra* variety).
 - ii. 35 percent rough bluegrass (*Poa trivialis*).
 - iii. 15 percent redtop (*Agrostis alba*).

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

- B. Pine Straw: Fresh, dry and free from debris, pine cones, or soil. Slash Pine is preferred.
- C. Peat Mulch: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 percent of dry weight.
- E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

2.8 EROSION-CONTROL MATERIALS

- A. Erosion-Control Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of the Work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Protect adjacent and adjoining areas from hydroseed overspray.

3.3 TOPSOIL PLACEMENT FOR LAWNS

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches. Remove stones, sticks and roots larger than 2 inches in any dimension from subgrade, 1" in playing fields. Completely remove trash and other extraneous debris from subgrade.

- C. Have topsoil tested by a certified soil testing laboratory to determine the type and quantity of soil amendments necessary.
- D. Sift topsoil to remove stones and other objects larger than 1" in any dimension. Sift topsoil to remove stones and other objects larger than ½" in any dimension in all playing fields. Maximum object size for topsoil shall be achieved by sifting not by hand removal or raking following placement of topsoil.
- E. Mix soil amendments and fertilizers with topsoil at rates required by soil testing. Delay mixing fertilizer if planting does not follow placing of planting soil within 4 days. Either mix soil before spreading or apply soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches (100 mm) of topsoil before planting.
- F. Mix lime with dry soil prior to mixing fertilizer.
- G. Spread topsoil to a minimum depth of six inches (6").

3.4 SEEDING LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
- B. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- C. Sow seed at the following rates:
 - 1. Seeding Rates:
 - a. General Lawn Areas- 200 lbs./acre.
- D. Rake seed lightly into top 1/4 inch of topsoil, roll lightly, and water with fine spray.
- E. Hydroseed all slopes 3:1 or steeper.
- F. Protect seeded areas 3:1 slope/grade or steeper against erosion by providing erosion-control blankets installed and stapled according to manufacturer's recommendations.
- G. Protect seeded areas less than 3:1 slope/grade against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre (45 kg per 100 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.

3.5 MAINTENANCE OF NEW LAWNS

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established. Maintain seeded lawns until Final Acceptance. Maintain all grassed areas as necessary to ensure a satisfactory lawn is achieved at Final Acceptance.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 - 1. Replant bare areas with same materials as for lawns.

2. Replace disturbed mulch.
- C. Watering: Provide and maintain temporary hoses, and lawn-watering equipment to convey water from a water source to keep lawns uniformly moist to a depth of 4 inches.
 1. Provide a source of water for irrigation. Utilize temporary irrigation meters, a well or water trucks as necessary for the water source.
 2. Water seeded areas as necessary to promote vigorous growth of grass but at the minimum rate of 1 inch per week.
 3. Water sodded areas per the requirements of the grower. Maintain moist soil to a depth of at least four inches.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at indicated height. Repeat mowing as required to maintain indicated height without cutting more than 40 percent of the grass height (minimum of 3 mowings). Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain following grass height:
 1. Mow grass to a finished height of 2 to 3 inches high.
- E. Apply pre-emergent herbicide to lawns areas. Apply 60 – 90 days after planting.

3.6 SATISFACTORY LAWN

- A. Seeded lawns shall be considered satisfactory/acceptable provided requirements, including maintenance, have been met and a healthy, uniform, close stand of grass is established, free of weeds, bare spots exceeding 5 by 5 inches (125 by 125 mm), and surface irregularities.
- B. Replant lawns that do not meet requirements and continue maintenance until lawns are satisfactory/acceptable.
- C. Substantial Completion of the building and the remainder of the project may be achieved (pending prior Architect and Owner approval) before achieving a satisfactory/acceptable lawn. Continue to replant and maintain unsatisfactory/unacceptable lawn areas until acceptance is obtained. Warranties for lawns shall begin at the time of acceptance of the lawn.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from sidewalks and paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

END OF SECTION 32 9200

SECTION 329300 - EXTERIOR PLANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Trees
 - 2. Shrubs
 - 3. Groundcovers
 - 4. Other Plant Materials
 - 5. Stakes & Guys

1.3 SUBMITTALS

- A. Installers Qualifications: Provide a list, with references, of the past three projects of similar scope.
- B. Product Data: For each type of product indicated.
- C. Plant Material Certifications:
 - 1. Certificates of inspection as required by governmental authorities.
 - 2. Label data substantiating that plant materials comply with specified requirements.
- D. Planting Schedule:
 - 1. Typewritten planting schedule.
 - 2. Once accepted, revise dates only as approved in writing and submitted to Architect.
- E. Maintenance Schedules: Typewritten instructions recommending procedures for maintenance of landscape work for one full year. Submit prior to completion of project.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer, who has successfully completed planting projects similar in size and complexity to this project. The installer's primary business (defined as a minimum of 60% of total billings) shall be exterior plant installation.
- B. Installer's Field Supervision: Installer to maintain an experienced full-time supervisor on the project site when exterior planting is in progress.
- C. Exterior Plant Materials:
 - 1. Provide plant materials of quantity, size, genus, species, and variety indicated on the Drawings.

2. All plant materials and work shall comply with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock."
 3. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Architect, together with proposal for use of equivalent material.
 4. The Architect may inspect plant materials either at place of growth or on site before planting, for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to further inspect trees for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees immediately from project site.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials:
1. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer or grower.
 2. Protect materials from deterioration during delivery, and while stored at site.
- B. Exterior Plant Materials
1. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.
 2. Deliver exterior plant materials after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set plant materials in shade, protect from weather and mechanical damage, and keep roots moist and free from frost.
 3. Do not remove container-grown stock from containers until planting time.
 4. Balled and burlapped material shall be freshly dug.
 5. Handle planting stock by root ball.

1.6 PROJECT CONDITIONS

- A. Examine the subgrade, verify the elevations, and observe the conditions under which work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required.
- C. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.
- D. Provide all necessary safeguards for the protection of all planted areas until provisional inspection/acceptance is accomplished.
- E. Planting Restrictions: Plant during one of the following periods.
1. Spring Planting: Unfrozen soil conditions March 1-June 1st.
 2. Fall Planting: September 1-November 1st or until frozen soil conditions prevent work.
 3. Summer Planting: June 1 – September 1 with approved irrigation system.

- F. Coordination with Lawns: Install plant materials after finish grades are established and before planting lawns, unless otherwise acceptable to the Architect.
 - 1. When planting exterior plants after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.7 WARRANTY

- A. Warranty exterior plant materials for a period of one year after date of Final Completion against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Contractor's control.
 - 1. The Contractor shall provide written notice to the Architect of any practice which will affect the warranty if not remedied promptly. The Architect will render an opinion of the conflict if necessary.
 - 2. Make replacements of all dead plants or plants in impaired condition (more than 25% dead or dying) condition in early spring/fall following installation. Replacements of dead or rejected plants should again be made prior to the expiration of the warranty period.

1.8 MAINTENANCE

- A. The Owner is responsible for maintaining all exterior plant material throughout the warranty period according to the submitted Maintenance Schedule.
- B. Remove all stakes and guy wires at the end of the 12 month guarantee period.

1.9 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Civil Engineer and then only after acceptable temporary utility services have been provided.
 - 1. Provide a minimum 48-hours' notice to the Civil Engineer and receive written notice to proceed before interrupting any utility.
- B. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

PART 2 – PRODUCTS

2.1 EXTERIOR PLANT MATERIALS

- A. General: Provide nursery-grown plant materials complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 PLANTS

- A. General: Provide healthy, disease-free plants of species and variety indicated. Provide only plants that are acclimated to outdoor conditions before delivery. Provide healthy, field-grown plants from a commercial nursery of species and variety shown or listed. Provide plants with heavy, well-branched tops and a vigorous well-developed root system.

2.3 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium. Revise fertilizer mix to remedy deficiencies found in soil.
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium. Revise fertilizer mix to remedy deficiencies found in soil.
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.4 MULCHES

- A. Organic Mulch: Six (6) month old well rotted double shredded native hardwood bark mulch not larger than 4" in length and 1/2" in width, free of woodchips and sawdust.
- B. Pine Straw: Fresh, dry and free from debris, pine cones, or soil. Slash Pine is preferred. Coverage for 3" is one bale per 50sq ft.

2.5 WATER

- A. Free of substances harmful to plant growth.

2.6 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content. Topsoil shall be fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks and other foreign materials.
- B. Topsoil Source:
 - 1. Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained sites where topsoil

occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2. Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.
3. Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.7 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
 2. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36-mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.
 3. Provide lime in form of dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.8 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; bio-solids; yard trimmings; or source-separated or compostable mixed solid waste.

- B. Sphagnum peat moss: Sphagnum peat moss shall be partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cubic foot (cubic meter) of loose sawdust or ground bark.
- E. Manure: Well-rotted, unleached, poultry, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.9 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

PART 3 – EXECUTION

3.2 EXAMINATION

- A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Tree save areas as indicated shall be tagged and approved by the Architect prior to any clearing and/or thinning.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before planting. Make minor adjustments as required.
- E. Lay out exterior plants at locations indicated. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

- F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.4 PLANTING BED ESTABLISHMENT

- A. Loosen subgrade of planting beds to a minimum depth of 4 inches (100 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off of Owner's property.
 - 1. Apply fertilizer directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
- B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.5 TREE AND SHRUB PLANTING

- A. Set all plant materials plumb and in center of pit or trench as per detail.
 - 1. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill with an amended soil blend consisting of five (5) parts native soil, one (1) part organic amendment and one (1) lb. fertilizer.
 - 4. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
 - 5. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling and maintain plumb while working backfill around roots and placing layers above roots. Tamp final layer of backfill. Remove injured roots by cutting cleanly, do not break.
 - 6. Form a ring of soil around the edge of each planting pit to retain water.
- B. Organic Mulching: Apply 3-inch (75-mm.) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.6 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs as indicated.

3.7 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants as indicated in details.
- B. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.8 CLEANUP AND PROTECTION

- A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.
- B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

3.9 DISPOSAL

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 32 9300

SECTION 331000 – SITE WATER UTILITIES

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 water systems piping for potable water service and fire protection service outside the building.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 15 Sections for fire protection systems inside building.
 - 2. Division 15 Sections for water distribution systems inside building.
 - 3. Division 31 Section "Earth Moving" for excavation, trenching, and backfilling.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure Ratings: Except where otherwise indicated, the following are minimum pressure requirements for water system piping.
 - 1. Underground Piping: 150 psi.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data, including pressure rating, rated capacity, and settings of selected models for the following:
 - 1. Meter boxes.
 - 2. Backflow preventers.
 - 3. Valves and boxes.
 - 4. Fire hydrants.
 - 5. Fire department connections.
 - 6. Yard hydrants.
 - 7. Identification materials and devices.
 - 8. Pipe and fittings.
 - 9. Alarm devices.
 - 10. Indicator posts.
 - 11. Meter vaults and boxes.
 - 12. Backflow prevention devices and enclosures.
 - 13. Tapping sleeves and saddles.
- C. Shop drawings for precast concrete pits. Include frames and covers. Include drains when indicated.

- D. Coordination drawings showing pipe sizes and valves, meter and specialty locations and elevations, if applicable. Include details of underground structures, connections, anchors, and reaction backing. Show other piping in same trench and clearances from water system piping. Indicate interface and spatial relationship between piping and proximate structures.
- E. Record drawings at Project closeout of installed water system piping and products according to Division 1.
- F. As-Built survey of installed water system. Perform and submit as-built survey as soon as possible following installation of water main piping and appurtenances. Survey shall be submitted at least 60-days prior to needed use of water main.
- G. Test reports specified in "Field Quality Control" Article in Part 3. Submit test reports at least 60-days prior to needed use of water main.

1.5 QUALITY ASSURANCE

- A. All materials, construction methods and testing shall comply with the requirements of the Rockingham County Standard Specifications and Details.
- B. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.
- C. Listing and Labeling: Provide equipment and accessories that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Product Options: Water systems specialties and accessories are based on specific types, manufacturers, and models indicated. Components by other manufacturers but having equal performance characteristics may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by Architect and Duplin County Water Department. The burden of proof of equality and approval by Duplin County Water Department of products is on the Contractor. Refer to Division 1 sections.
- E. All work within any NCDOT right-of-way shall conform to the requirements of the current version of the NCDOT's Policies and Procedures for Accommodating Utilities on Highway Rights of Way, the provisions and conditions of the encroachment agreement(s), and other applicable NCDOT standards and policies. The encroachment agreement(s) are considered part of the project specifications by reference. Copies of the agreement(s) will be provided upon request from the Architect.
- F. Perform As-Built Survey of installed water system piping and products according to Duplin County Water Department As-Built drawing requirements. As-built survey shall be submitted in digital (dwg) and hard copy formats. The hard-copy shall be signed and sealed by a NC Professional Land Surveyor. Survey shall include the following:
 - 1. All fire hydrant water valve sizes and locations with no less than two primary reference dimensions from permanent above grade features.
 - 2. Locations of bacteriological sampling points.
 - 3. Pipe materials and sizes.
 - 4. Other water system components such as meters, backflow preventers, etc.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, for shipping as follows:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends, flange faces, and weld ends.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. Storage: Use the following precautions for valves, including fire hydrants, during storage:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors and maintain temperature higher than ambient dew point temperature. Support valves off ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and piping specialties from moisture and dirt.
- G. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water system piping may be installed in compliance with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with Duplin County Water Department. Obtain all necessary permits for pavement cuts, line taps, etc. from the authorities having jurisdiction.
- B. Coordinate with pipe materials, sizes, entry locations, and pressure requirements of building fire protection and building water distribution systems piping.
- C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work are specified herein. Products by other manufacturers having equal performance characteristics may be considered, however approval must be acquired by the Contractor from Duplin County Water Department.

2.2 PIPES AND TUBES

- A. Ductile-Iron Pipe: AWWA C150 and C151, laying condition Type 1 and working pressure of 350 psi. All ductile-iron pipe shall be listed by ANSI/NSF Standard 61 for potable water contact.
1. Lining: AWWA C104, cement mortar, bituminous seal coated.
 2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
 3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
 4. Mechanical-Joint-Type Pipe: AWWA C111, rubber gaskets, ductile- or cast-iron glands, and steel bolts and nuts.
 5. Coating: AWWA C151, bituminous coating.
 6. Restrained-Joints: All restrained joint ductile iron pipe unless otherwise specified shall be of the boltless restrained joint type as assembled with a steel flexible ring that locks into position inside the bell of the connecting pipe. The locking rings shall be one-piece construction. For installations requiring welded locking rings, the rings shall be factory welded. The restrained joints shall provide a minimum of 4-degrees of deflection for pipe sizes, 4-inches through 12-inches in diameter.
 - a. All proprietary pipe restraint systems shall be approved by Duplin County Water Department and provided in compliance with all standards for coatings, linings, pressure classes, etc. as required for ductile iron pipe. All restrained joint pipe shall be installed based on laying conditions, pressure class, etc. as required for typical ductile iron pipe. Contractor shall be responsible for obtaining Duplin County Water Department approvals.
- B. Copper Tube: ASTM B 88, Types K, seamless water tube, annealed temper. All copper pipe shall be NSF Listed for potable use.
- C. PVC Pipe: ASTM D 2241, SDR 21, gasket joints or ASTM D 1785, Sch-40, solvent joints. All PVC pipe shall be NSF Listed for potable use.
- D. Steel Encasement Pipe: ASTM A139 and A283, longitudinally welded of smooth-wall seamless, grade "B" steel, Minimum yield strength of 35,000-psi.
1. Thickness: Per NCDOT encroachment agreement but no less than 0.375-in. Ends shall be beveled and prepared for field welding at the circumferential joints.
 2. Coatings: Inside and outside, AWWA C203, ASTM 3034-12454 B and any additional requirements of NCDOT.
 3. Pipe Support: A minimum of one metal 'spider' device shall be provided for each joint of pipe.
 4. Size: The inside diameter of the encasement pipe shall be 8-in greater than the nominal inside diameter of the carrier pipe.
 5. Pipe Ends: Pipe ends shall be right-angled and shall be compatible to receive a "Dresser style 62" – Type I or approved equal mechanical transition coupler.

2.3 PIPE AND TUBE FITTINGS

- A. Ductile-Iron and Cast-Iron Pipe Fittings: AWWA C110, ductile-iron or cast-iron, 250-psig minimum pressure rating; or AWWA C153, ductile-iron compact fittings, 250-psig pressure rating. All ductile-iron fittings shall be listed by ANSI/NSF Standard 61 for potable water contact.
 - 1. Lining: AWWA C104, cement mortar.
 - 2. Gaskets: AWWA C111, rubber.
 - 3. Joints: AWWA C111, mechanical joint, all bell.
 - 4. Coating: AWWA C151, bituminous coating.
- B. Copper Tube Fittings: AWWA C800, flared copper type brass fittings. All copper fittings shall be NSF Listed for potable use.
- C. PVC Plastic Fittings: ASTM D 2466, Sch-40. All PVC fittings shall be NSF Listed for potable use.

2.4 VALVES

- A. Gate Valves 3 Inches and Larger: AWWA C509 or AWWA C515, resilient seated; bronze stem, cast-iron or ductile-iron body and bonnet, stem nut, 250-psig working pressure, minimum UL/FM rating of 200-psi. All coating materials shall comply with NSF 61.
 - 1. Gate valves shall be fusion bonded epoxy, (FBE) coated both interior and exterior at a minimum of 10mils and the FBE coating shall be provided in conformance with AWWA C550. The gate valve wedge shall be fully encapsulated in rubber. All sealing gaskets shall be made of EPDM rubber materials.
 - 2. All valves shall be rated for bi-directional flow.
 - 3. Gate valves shall be restrained by stainless steel rodding, concentric ring restrained connections or wedge action retainer glands. In all cases, the valve and piping shall be restrained on both sides to sufficiently allow the valve to function as a dead end.
 - 4. All gate valves shall open left with a non rising stem and be provided with a 2-inch square operating nut and mechanical joint ends except for valves installed in vaults or other enclosures which shall be rising stem with flanged ends.
 - 5. All gate valves shall be constructed with triple o-ring seals in which 2 o-rings are located above the thrust collar and 1 o-ring is located below the thrust collar. The two upper o-rings shall be replaceable with the valve fully open and subjected to full rated working pressure.
 - 6. Post Indicator Valves shall be non-rising stem with flange for indicator post.
- B. Combination Air Valves shall be provided to purge air from the system at startup, vent small pockets of air while the system is being pressurized and running, and prevent critical vacuum conditions during draining.
 - 1. Combination air valves rated for potable water use shall be installed at all high points of water lines 8 inches in diameter or larger and at other locations such as major changes in grade. A high point shall be determined as any high location where the difference between the high elevation and adjacent low elevation exceeds 10-ft.
 - 2. All combination air valves shall be provided in conformance with AWWA C-512. The combination air valve shall automatically exhaust large volumes of air from the system when it is being filled and allow air to re-enter the pipe when the system is being drained. The water main shall be installed at a grade which will allow the air to migrate to a high point where the air can be released through an air valve. A minimum pipe slope of 1 foot in 500 feet should be maintained.
 - 3. Combination air valves shall be of the single housing style with Type 304 or 316 stainless steel body that combines the operation of both an air/vacuum and air release valve. The valve shall have a minimum two (2) inch NPT inlet and the inlet body shall be rated for minimum 230 PSI working pressure. Combination air valves sized from 2-inches to 4-inches shall be provided with

NPT inlets and outlets unless otherwise submitted for approval with flanged connections. The combination air valve shall be provided with cylindrical shaped floats and anti-shock orifice made of high density polyethylene. Combination air valves with spherical floats shall not be accepted. All combination air valves shall be installed in accordance with Duplin County Water Department Standard Details.

4. The combination air valve shall be installed in standard eccentric manhole. All combination air valve assemblies shall be provided with a saddle tap in the same sizing as the combination air valve assembly and isolated with a gate valve of the same size. The isolation gate valve shall be provided with NPT threads and connected with "no lead" brass (meeting UNS C89833 as per ASTM B584) or bronze piping. The isolation valve shall be rated for 200-psi service or greater
- C. Nonrising Stem Gate Valves, 2 Inches and Smaller: MSS SP-80; body and screw bonnet of ASTM B 62 cast bronze; with Class 125 threaded ends, solid wedge, nonrising copper-silicon alloy stem, brass packing gland, polytetrafluoroethylene (PTFE)-impregnated packing, and malleable-iron handwheel.
- D. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, boxes shall be of the screw or telescopic type, valve box ring adjustments will not be allowed. The valve box shall be centered over the wrench nut and seated on compacted backfill without touching the valve assembly. All valve boxes shall be encased in a trowel finished 2' x 2' x 6" pad of 3000-psi concrete beneath the asphalt with the cover flush with the top of the pavement or flush with the finished grade. Precast concrete valve box encasements may be used for valve box encasement outside of paved areas provided the assembly is buried flush with the surface grade and compacted properly to prevent movement of the precast encasement.
- E. Indicator Posts: UL 789, FM-approved, vertical type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve. Post indicator valves (PIVs) on fire protection systems shall be equipped with a supervisory switch.
- F. Corporation Stops: Ball type, made of "no lead" brass (meeting UNS C89833 as per ASTM B584) and complete with a compression coupling and AWWA Standard threads as per AWWA C800. All corporation stops shall be rated for a working pressure of 300-psi.
1. Taps shall be located at 10:00 or 2:00 o'clock on the circumference of the pipe. Service taps shall be staggered alternating from one side of the water main to the other and at least 12 inches apart. The taps must be a minimum of 24 inches apart if they are on the same side of the pipe.
 2. No burned taps will be allowed and each corporation stop shall be wrapped with Teflon tape for ductile iron pipe water mains. No taps are allowed on a fire hydrant line. No tapping shall be made where rodding is placed.
 3. Service Saddles shall be used on all ductile iron water mains for taps larger than 1-inch or otherwise when direct taps cannot be made. Service saddles shall be used for all taps on existing water mains other than ductile iron, such as asbestos cement, PVC, etc. Service Saddles shall be provided with brass body and fasteners (85-5-5-5 waterworks brass or "no lead" brass meeting UNS C89833 as per ASTM B584) conforming to AWWA C800 and double straps made of silicon bronze conforming to ASTM A98 and factory installed grade 60 rubber gaskets. Service saddles shall be provided with AWWA standard threads per AWWA C800.
- G. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
1. Tapping sleeves shall be fabricated of ductile iron construction in a two-piece assembly with mechanical joint connections to the main line and flanged connection to the tapping valve.

2. All MJ tapping sleeves shall be rated for a working pressure of 200-psi or greater and provided with a ¾-inch test plug for testing. All tapping sleeves shall be hydrostatically tested up to 200-psi before a tap is made. Tapping sleeves shall NOT be air tested.
3. All mechanical joint tapping sleeves shall be manufacturer fabricated and approved for installation on the specific main line pipe material, whether ductile iron or asbestos cement.

H. Ball Valve: PVC, quarter turn, true union ball valves. Rated to 200-psi., Teflon ball seats. Listed by NSF for use in potable water service.

2.5 VAULTS

A. Concrete vaults shall meet HS-20 loading requirements and shall be located outside of travel areas. Portland cement mix, 3000 psi .

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

C. Ladder: ASTM A 36, steel or polyethylene-encased steel steps.

D. Access door: Aluminum with flush top handle, stainless steel hinges, bolts and slam lock, automatic hold open arm, and compression springs to allow for easy opening.

E. Drain: Positive drainage with rodent proofing shall be provided for all below ground vaults.

2.6 FIRE HYDRANTS

A. Hydrants shall conform to AWWA C502 with a minimum valve opening of 4 1/2 inches. Mechanical joint, bronze to bronze seating, minimum 4 foot bury depth with a break away ground line flange and break away rod coupling. The hydrant bonnet shall be designed with a sealed oil or grease reservoir with O-ring seals and a Teflon thrust bearing. All fire hydrants shall be designed and rated for a working pressure of 250-psi or greater.

1. Outlets: One 4 1/2 inch steamer and double 2 1/2 inch hose connections with National Standard Threads. Include cast-iron caps with minimum 2/0 twist link, heavy -duty, non-kinking, machine chains.
2. Operating and Cap Nuts: Pentagon 1-1/2 inch point to flat.
3. Direction of Opening: Open hydrant valve by turning operating nut to the left, or counterclockwise.
4. Finish: Red exterior alkyd gloss enamel paint.

2.7 FIRE DEPARTMENT CONNECTIONS

A. Exposed, Sidewalk Fire Department Connections: UL 405, cast-brass body, with thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded NPS bottom outlet. Include lugged cap, gasket, and chain; lugged swivel connection and drop clapper for each hose

connection inlet; 18-inch high brass sleeve; and round sidewalk escutcheon plate marked "STANDPIPE" in 2-in letters. Connections shall be two 2 ½ inch inlets and 4 inch outlet.

- B. Wafer Check Valve: UL Listed/FM Approved, lead free, ductile iron body, bronze clapper and seat ring, 'O' ring seals, stainless spring closure, with ½" ball drip valve below seat to allow valve to drain water from FDC. Valves shall be Empire Wafer Silent Check Valve or ITT Kennedy Wafer Check Valve.
- C. Signage: Approx. 18"x10", steel, white background with min. 6" red lettering, marked FDC, mounted on a galvanized steel pole with concrete footing. Mounting height to bottom of sign: 5-ft. min.
 - 1. Secondary sign: Similar to primary signage in size and material, copy to be determined by code official.

2.8 BACKFLOW PREVENTERS

- A. General: As approved by the Underwriters Laboratories and/or the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California and Duplin County Water Department.
- B. Double-Check Assembly (DCVA) Backflow Preventers – ¾" thru 2": ASSE 1015, AWWA C510, CSA B64 Certified and USC Foundation for Cross Connection Control and Hydraulic Research approved with full port, resilient seated ball valve shut-off valves and four ball valve test cocks. Include 2 spring loaded, center guided check assemblies.
- C. Double-Check Assembly (DCVA) Backflow Preventers 2-1/2" thru 10": ASSE 1015, AWWA C510, CSA B64 Certified and USC Foundation for Cross Connection Control and Hydraulic Research approved, FM approved or UL listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include 2 positive-seating check valves and test cocks for continuous-pressure application. Pressure loss shall be 5-psig maximum through middle third of flow range. Assembly shall be of a compact design utilizing a flow orientation of inlet flow vertical up, outlet flow vertical down at the direct outlet of the gate valves. Febco Model 870 or approved equal.
- D. Double-Check Detector Assembly (DCDA) Backflow Preventers 2-1/2" thru 10": ASSE 1048, FM approved or UL listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include 2 positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double check backflow preventer, for continuous-pressure application. Pressure loss shall be 5-psig maximum through middle third of flow range. Assembly shall be of a compact design utilizing a flow orientation of inlet flow vertical up, outlet flow vertical down at the direct outlet of the gate valves. Febco Model 876 or approved equal.
- E. Reduced Pressure (RP or RPZ) Backflow Preventers – ¾" thru 2": ASSE 1013, AWWA C511, CSA B64 Certified and USC Foundation for Cross Connection Control and Hydraulic Research approved with full port, resilient seated ball valve shut-off valves and ball valve test cocks. Include 2 spring loaded, center stem guided check valves and one hydraulically dependednt differential relief valve.
- F. Reduced Pressure (RP or RPZ) Backflow Preventers – 2-1/2" thru 10": ASSE 1013, AWWA C511, CSA B64 Certified and USC Foundation for Cross Connection Control and Hydraulic Research approved, FM approved or UL listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves for continuous-pressure application. Assembly shall be of a compact design utilizing a flow orientation of inlet flow vertical up, outlet flow vertical down at the direct outlet of the gate valves. Febco Model 880V, Wilkins Model 475, or approved equal.

- G. Reduced Pressure Detector Assembly (RPDA) Backflow Preventers – 2-1/2" thru 10": ASSE 1047, USC Foundation for Cross Connection Control and Hydraulic Research approved, FM approved and UL listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and reduced pressure backflow preventer, for continuous-pressure application. Wilkins Model 475DA or approved equal. Gate valves on backflow preventers on fire protection systems shall be equipped with supervisory switches.

2.9 YARD HYDRANTS

- A. Yard Hydrants, Post Type: ASSE 1057 listed, sanitary, lockable, nonfreeze, post-type, 3/4-inch inlet, integral ASSE 1052 double-check backflow preventer with outlet conforming to ASME B1.20.7, 3/4-11.5NH threads for garden hose. Include bronze casing, cast-iron or cast-aluminum casing guard, tapped drain port in valve housing, and key operation. Hydrant shall be of length required for a mounting height of 30" and installation of inlet valve below frost line (24" min. bury). Furnish 2 keys for each hydrant.

2.10 ANCHORAGES

- A. Thrust Blocking: Thrust restraint blocking for all fittings or components subject to hydrostatic thrust shall be securely anchored by the use of concrete thrust blocks poured in place. The reaction areas are shown in the Details. No concrete shall interfere with the removal of fittings. Material for reaction blocking shall be 3,000-psi concrete. A minimum 4 mil plastic shall cover the fitting to ensure that no concrete will interfere with removal of the fitting. Alternative restraining methods and mechanical joint restraints may be used upon approval by Duplin County Water Department Director of Engineering.
- B. Rodding: All rodding shall be constructed with type 304 stainless steel rods at the number and sizing specified in the following table. Rod coupling shall not be allowed. Rodding requirements are as follows:

4-in branch	2, 3/4-in steel rods
6-in branch	2, 3/4-in steel rods
8-in branch	4, 3/4-in steel rods
12-in branch	6, 3/4-in steel rods
- C. Wedge Action Retainer Glands: Wedge action retainer glands may be used as a substitute for rodding, but shall not substitute for typical reaction blocking. All wedge action retainer glands shall be manufactured as a one piece retainer gland for use with mechanical joint fittings and shall be rated to provide restraint up to 350-psi pressure rating for sizes through 16-inches. For sizing above 16-inches, the wedge action retainer gland shall be rated to provide restraint up to 250-psi. Approved wedge action retainer glands shall be made of ductile iron, coated with a manufacturer applied epoxy coating or polyester powder coating.
 - 1. In cases where wedge action retainer glands are approved for pipe restraint of fire hydrant supply lines or other applications, the wedge action retainer gland shall be joined with a mechanical joint pipe bell and the entire hydrant supply line shall be restrained. Wedge action retainer gland connections to push on pipe are not allowed.

2.11 IDENTIFICATION

- A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

2.12 WATER METERS

- A. Meters shall be set by Duplin County Water Department. The Contractor shall coordinate installation directly with Duplin County Water Department. Contractor is responsible for all meter permits and installation fees.
- B. Meter vaults and access doors within street right of way shall meet HS-20 loading requirements and shall be located outside of travel areas. Pedestrian rated covers of 300-psf are not allowed. The access double doors shall be aluminum with a flush drop lift handle, stainless steel hinges and bolts, a stainless steel slam lock, an automatic hold open arm, and compression springs to allow for easy opening. To ensure positive drainage, the vault shall be tied into the adjacent storm drainage system.

2.13 PROTECTIVE ENCLOSURES

- A. General: Manufactured, weather-resistant enclosure designed to protect aboveground water piping equipment or specialties. Enclosures shall be sized as required for access and service of protected unit. Enclosures for compact design backflow preventors shall be no larger than 64"(L)x60"(W)x60"(H) Enclosures shall be as manufactured by Hot Box or approved equal.
 - 1. Housing: Reinforced-aluminum or reinforced-fiberglass construction. Factory applied paint. Color to be selected by Architect from manufacturer's standard color choices.
 - 2. Drain opening: Sized to alleviate a full release by the backflow preventer.
 - 3. Hinged access doors with locking device.
 - 4. Insulation inside housing.
 - 5. Electric heater with self-limiting temperature control (for 2-1/2" or larger backflow preventers) or plug-connected pipe heating cable (for 2" and smaller backflow preventors) and connection to power supply. Heating equipment shall be designed and furnished by the enclosure manufacturer.
 - 6. Concrete base slab: 4 inch thick of dimensions required to extend at least 6 inches beyond edges of housing. Provide PVC sleeves at water pipe penetrations through slab.
 - 7. Anchoring devices to attach housing to base with stainless steel mouting hardware.

2.14 ALARM DEVICES

- A. Description: UL 753, FM approved, of type and sizes to mate and match piping and equipment.
- B. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

PART 3 - EXECUTION

3.1 GENERAL

- A. All construction shall conform to the Standard Specifications and Details of Duplin County Water Department and the NCDOT as applicable in addition to the requirements state herein.

3.2 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 SERVICE ENTRANCE PIPING

- A. Extend water system piping and connect to water supply source and building water distribution and fire protection systems in locations and pipe sizes indicated.
 - 1. Terminate domestic water system piping at 5-feet outside building wall until building water systems are installed. Terminate piping with caps, plugs, or other fittings as required for piping material. Make connections to building water system when those systems are installed.
 - 2. Terminate fire protection water system 12-in above finish floor elevation within building with caps, plugs, or flanges as required for piping material. Coordinate exact locaiton with fire protection contractor. Install restrained joints for buried piping within 60 inches of building. Use restrained-joint pipe and fittings, thrust blocks, anchors, tie-rods and clamps, and other supports at vertical and horizontal offsets.

3.4 JOINT CONSTRUCTION

- A. Ductile-Iron Piping Gasketed Joints: Construct joints according to AWWA C600.
- B. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads. Flanged joints shall be used in vaults or above grade installations only.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated except where deviations to layout are approved on coordination drawings.
- B. Install piping at indicated slope.
- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Except as otherwise indicated, make piping connections as specified below within vaults or above-ground. Do not use flanges, unions or keyed couplings at underground installations.
 - 1. Above grade: Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch or smaller threaded pipe connection.
 - 2. Above grade: Install flanges, in piping 2-1/2 inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
 - 3. Below grade: Join copper pipe with flared copper type brass fittings.
 - 4. Below grade: Join ductile iron pipe with push-on joints. Join fittings with mechanical joints.
 - 5. Install dielectric fittings to connect piping of dissimilar metals.

3.6 PIPING INSTALLATION

- A. Water Main Connection: Tap water main with size and in location as indicated according to requirements of Duplin County Water Department.
 - 1. Install tapping sleeve and tapping valve according to manufacturer's installation instructions.

2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water service piping.
 5. Install service clamps and corporation stops in size, quantity, and arrangement required by Duplin County Water Department standards and according to manufacturer's installation instructions.
 6. Install service clamps on pipe to be tapped. Position outlet for corporation stop.
 7. Install corporation stops into service clamps. Install valve with stem pointing up and with cast-iron valve box.
 8. Install curb stop in service piping with head pointing up and with cast-iron service box.
 9. Install manifold for multiple taps in water main.
 10. Use drilling machine compatible with service clamp and corporate stop. Drill hole in main. Remove drilling machine and connect water service piping.
- B. Comply with requirements of NFPA 24 for materials and installation.
- C. Install ductile-iron pipe and ductile-iron and cast-iron fittings according to AWWA C600.
- D. Install copper tube and wrought-copper fittings according to CDA No. 404/0 "Copper Tube Handbook."
- E. Bury piping at minimum depth of 3 feet below finished subgrade and not less than 18 inches below average local frost depth.
- F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- G. Shoring or bracing of pits, trenches and other excavations shall be in accordance with the requirements of NCDOT and OSHA.
- H. The subgrade at the bottom of the trench shall be shaped to secure uniform support throughout the length of the pipe. A space shall be excavated under the bell of each pipe to provide space to relieve bearing pressure on the bell and provide room to adequately make the joint.
- I. Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not be permitted to enter pipe.
- J. Backfill material shall be free from stones greater than 4-inches in diameter, construction material debris, frozen material, organic matter, or unstable material. Backfill materials shall be placed in loose lifts of 8-inches or less in depth. All backfill shall be compacted to not less than 95% of the standard Proctor maximum dry density except the final foot beneath pavement or slab areas where this requirement shall be increased to 98% of the standard Proctor maximum dry density.
- K. Install and test fire protection piping and appurtenances in accordance with the specific requirements of Duplin County Water Department and applicable NFPA requirements.
- 3.7 ANCHORAGE INSTALLATION
- A. Anchorages: Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Ductile-Iron Piping: According to AWWA C600.

2. Fire Service Piping: According to NFPA 24.

- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.
- C. Use thrust blocking anchorages unless noted otherwise. Use mechanically restrained joint pipe and fittings only where specifically noted and approved by Duplin County Water Department.

3.8 FIRE HYDRANT INSTALLATION

- A. Install fire hydrants plumb and as indicated on the Drawings. Orient hydrant with pumper nozzle facing the closest curb of a fire lane or street, but not a parking space.
- B. The back of the hydrant opposite the pipe connection shall be firmly blocked against the vertical face of the trench with 1/3 cubic yard of concrete. Double bridle rods and collars shall be connected from the tee to the hydrant. Rods shall not be less than 3/4 inch diameter and made of stainless steel rod stock for corrosion protection. A minimum of 8 cubic feet of stone shall be placed around the drains. The backfill around the hydrants shall be thoroughly compacted and closely match the elevation on the approved plans. Hydrant extensions will not be allowed on new or retrofit installations.
- C. For fire hydrant installations outside of intersections, the Contractor may choose to utilize concentric ring restrained fittings in combination with concentric ring restrained gate valves and fire hydrants without typical blocking and rodding. In this case, the entire hydrant supply line shall be fabricated with restrained joints. The Contractor may also elect to utilize typical mechanical joint fittings, restrained with wedge action retainer glands. The wedge action retainer glands, shall be installed on all sides of the mechanical joint branch fitting, both sides of the valve, and the fire hydrant to restrain any mechanical joint pipe connections on the hydrant supply line.

3.9 ROUGHING-IN FOR WATER METERS

- A. Install roughing-in piping and specialties for water meter installation as indicated on the Drawings and according to Duplin County Water Department requirements.

3.10 PIT CONSTRUCTION AND INSTALLATION

- A. Construct pits of poured-in-place concrete or provide precast concrete pits of dimensions indicated, with access frame and cover, ladder, and drain. Include sleeves with waterproof mechanical sleeve seals for pipe entry and exit.
- B. Connect vault drain outlet to storm drain

3.11 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to plumbing and health department authorities having jurisdiction.
- B. Do not install bypass around backflow preventer.
- C. Do not install reduced-pressure-principle-type in pit.
- D. Support backflow preventers, valves, and piping on 3000-psi minimum, portland-cement-mix concrete piers.

- E. Contractor shall contract with qualified personnel to perform and provide certification of installed backflow prevention devices.

3.12 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install fire department connections in locations indicated in accordance with NFPA 14 and 24 and within 50-ft of a fire hydrant.
- B. Install wafer check valve with ball drip valve at each fire department connection. Install concrete or cast iron vault set on #57 washed stone at wafer check valve.
- C. Orient nozzles of FDC toward vehicle travelway.
- D. Install signage out of pedestrian and vehicle travelways near FDC. Front of sign to face primary vehicle travelway.

3.13 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.
- C. Connect alarm devices to building fire alarm system.

3.14 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 inches to 8 inches below finished grade, directly over piping.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.15 FIELD QUALITY CONTROL

- A. General: All materials shall be inspected by the County's inspector prior to installation. The Contractor shall furnish all materials, labor and equipment to perform all testing and inspections. Duplin County Water Department shall provide water for testing purposes on water mains in accordance with County Standard Procedure 4, Control and Monitoring of Water System Flow Activity.
- B. Hydrostatic Testing:
 - 1. No valve in the County water system shall be operated without authorization in accordance with the County Standard Procedure 4, "Control and Monitoring of Water System Flow Activity." A section of line that is to be hydrostatically tested, shall be slowly filled with water at a rate which will allow complete evacuation of air from the line. Hand pumps shall not be used for the pressure testing of water mains. Taps used for testing purposes shall be removed after testing and repaired using a stainless steel full circle repair clamp.
 - 2. Fill the line slowly to avoid undue impacts associated with surge and to allow air to evacuate the pipeline. After all air has been expelled from the water main, the line shall be tested to a pressure of 200 psi as measured at the lowest elevation of the line for a duration of 2 hours. The

testing period shall not commence until all air has been evacuated and the pressure has stabilized. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10-psi or less. The pressure gauge shall be liquid-filled and indexed for an operating range of 300-psi or less with a minimum dial size of 3-1/2 inches. At the end of the test period, the leakage shall be measured with an accurate water meter.

3. Any measured leakage not within the allowable limits as specified in the following table shall require repair of the water main and additional testing until the standards are met. For pipe sizes other than those shown, the Contractor shall test within the allowable leakage amounts as specified by AWWA C600-99. All visible leaks shall be repaired regardless of the amount of leakage .

Pipe Size (in)	Allowable Leakage (Gal/Hr per 1000 ft of pipe)
4	0.38
6	0.57
8	0.76
12	1.15

- C. Disinfection: All additions or replacements to the water system shall be disinfected with chlorine in conformance with AWWA C651 before being placed in service under the supervision of the County's Inspector in the following manner.

1. Taps shall be made at the control valve at the upstream end of the line and at all extremities of the line including valves.
2. A solution of water containing 70% HTH available chlorine shall be introduced into the line by regulated pumping at the control-valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of not less than 50-ppm and not more than 100-ppm total chlorine immediately after chlorination. The chart below shows the required quantity of 70% HTH compound to be contained in solution in each 1000 feet section of line to produce the desired concentration from 50-ppm to 100 ppm.

Pipe Size (in)	Lbs. of HTH (70%) Per 1000-ft of Pipe
6	0.88 – 1.76
8	1.56 – 3.12
10	2.42 – 4.84
12	3.50 – 7.00
14	4.76 – 9.52

3. The HTH Solution shall be circulated in the main by opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution must be pumped in at a constant rate for each discharge rate so a uniform concentration will be produced in mains.
4. HTH solution shall remain in lines for no less than 24 hours or as directed by the County's Inspector.
5. Extreme care shall be exercised at all times to prevent the HTH solution from entering existing mains.
6. Free residual chlorine after 24 hours shall be at least 10 ppm or the Inspector will require that the lines be re-chlorinated.
7. Contractor shall engage an independent laboratory to conduct bacteriological and post-chlorination test to clarify that the water meets the required quality of drinking water.

D. Flushing:

1. Flushing of lines may only proceed after 24 hours of disinfection contact time and as directed by County staff, provided the free residual chlorine analysis is satisfactory.
2. At the completion of disinfection, chlorinated water flushed from the water main shall be disposed of in conformance with all Federal, State and local regulations.
3. In accordance with all applicable regulations, a neutralizing chemical shall be applied to minimize chlorine residual in the flushing water before discharging from the water main, unless an alternate plan is submitted in writing and approved by the County.
4. Water used for disinfection shall be flushed from the water main until the chlorine residual concentration is below 5-ppm before initiating sampling.

E. Bacteriological and Turbidity Sampling

1. Bacteriological sampling shall be utilized to verify disinfection prior to placing a newly constructed water main in operational service. Bacteriological sampling shall consist of 2 consecutive sets of acceptable samples taken at least 24-hours apart and collected from each 1,200-ft section of water main and all dead ends and branches as outlined by ANSI/AWWA C651.
2. For the first round of sampling, the requested laboratory analysis shall be specified as follows: "Bacteriological Test and Turbidity." For the second round of testing, the laboratory analysis shall be specified as, "Bacteriological Test Only."
3. Samples for laboratory analysis shall be collected by the County's Inspector after flushing is completed. The Contractor shall furnish the sample bottles, the testing agency and such help as may be required to secure these samples. The contractor shall make arrangements with the laboratory that all test results be submitted directly to the County's inspector or other designee approved by the Engineering Inspector. All costs for laboratory testing shall be borne by the Contractor.
4. The laboratory secured for testing shall be certified by the State Laboratory of Public Health. All sample bottles for bacteriological sampling provided by the laboratory shall be sterilized and treated with a dechlorinating agent, such as sodium thiosulfate. Samples for turbidity shall be taken in plain sterilized bottles from the lab, which are separate from the bottles provided for bacteriological testing. The sample bottles shall be provided with tamper proof seals that will be adhered to the bottles by the County's inspector. The inspector shall provide a sample identification number, job title and an identification of Phase 1 or Phase 2 sampling that will be provided on the tamper proof custody seal. The bottles and tamper proof custody seals shall be accompanied by a chain of custody form provided by the certified laboratory conducting the testing. All sample identification numbers, job titles, and Phase 1 or Phase 2 testing identification from the custody seal shall be recorded on the chain of custody forms by the Engineering Inspector.
5. All samples shall be collected in compliance with the sampling protocols provided by the certified laboratory, and processed for delivery under the direct supervision of the Engineering Inspector. The samples shall be collected by the County's inspector or designee and kept in a cooler provided by the Contractor at approximately 40-degrees Fahrenheit or 4-degrees Celsius and delivered to the certified lab for testing as soon as possible. The time at which the sample is taken shall be recorded on the chain of custody form by the Engineering Inspector. Any samples processed at the laboratory more than 30-hours following collection shall be declared invalid, i.e. samples shall be submitted to the lab within 24-hours of collecting them.
6. All first round samples shall be tested for bacteriological quality and turbidity in accordance with standards established by NCDENR and AWWA. If turbidity exceeds 0.8 NTU, the sample shall fail and the system shall be refushed before initiating a new round of testing.
7. If the phase 1 sample results for bacteriological quality and turbidity are acceptable, then a second set of samples can be collected at least 24-hours following the first sample collection. No

additional flushing other than required to obtain a representative sample will be allowed prior to collecting the second set of samples.

8. The second set of samples shall be tested for bacteriological quality only. All custody seals and chain of custody forms shall identify the second round samples as "Phase 2" testing to notify the lab that the first set of samples have already been evaluated and received a satisfactory laboratory analysis.
 9. At the completion of sampling, the total chlorine concentration shall be at least 2-mg/L and no higher than 4-mg/L before the system can be made operational.
 10. If test results are unsatisfactory, the Contractor shall immediately rechlorinate lines and proceed with such measures as are necessary to properly disinfect the lines.
 11. The new water system shall be valved off from the existing system until a satisfactory bacteriological laboratory analysis has been obtained and the Inspector has authorized the use of the new water system.
- F. Private Fire Service System Flushing & Testing: In addition to the testing, disinfection and flushing listed above, perform additional flushing and all tests as required by NFPA 14 and NFPA 24.
1. Complete and submit "Contractor's Material and Test Certificate for Underground Piping" (NFPA 14) upon satisfactory completion of system flushing and all tests.
- G. Backflow Prevention Device Certification
1. All new or relocated backflow prevention devices shall be tested and certified by a licensed inspector prior to operation of the water system. Performance, coordination and submittal of documentation of the testing and certification shall be the responsibility of the Contractor.

END OF SECTION 331000

SECTION 333000 – SITE SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes sewerage systems outside the building.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 3 Section "Cast-in-Place Concrete" for cast-in-place concrete structures.
 - 2. Division 15 Sections for sanitary sewer systems inside and adjacent to building, including grease interceptors.

1.3 DEFINITIONS

- A. Sewerage Piping: System of sewer pipe, fittings, and appurtenances for gravity flow of sanitary sewage.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

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 the following:
 - 1. Cleanouts.
 - 2. Pipe and fittings.
 - 3. Couplings.
 - 4. Manhole Appurtenances.
- C. Record drawings at Project closeout of installed water system piping and products according to Division 1.
- D. As-Built survey of installed sanitary sewer mains and manholes. Perform and submit as-built survey as soon as possible following installation of manholes and sewer main piping. Survey shall be submitted at least 60-days prior to needed use of sewer main.
- E. Inspection and test reports specified in the "Field Quality Control" Article.

1.6 QUALITY ASSURANCE

- A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage systems.

- B. Utility Compliance: Comply with Town of Kenansville regulations pertaining to sanitary sewerage systems.
- C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific manufacturer types indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Product Substitutions."
- D. All work within any NCDOT right-of-way shall conform to the requirements of the current version of the NCDOT's Policies and Procedures for Accommodating Utilities on Highway Rights of Way, the provisions and conditions of the encroachment agreement(s), and other applicable NCDOT standards and policies. The encroachment agreement(s) are considered part of the project specifications by reference. Copies of the agreement(s) will be provided upon request from the Architect.
- E. Perform As-Built Survey of installed sewer system piping and products according to Town of Kenansville As-Built drawing requirements. As-built survey shall be signed and seal by a NC Professional Land Surveyor and shall include the following:
 - 1. All manhole invert and rim elevations and horizontal locations with no less than two primary reference dimensions from permanent above grade features.
 - 2. All cleanout locations with no less than two primary reference dimensions from permanent above grade features.
 - 3. Pipe materials, sizes, lengths, and slopes.
 - 4. Other sewer system components such as grease traps, etc.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures in direct sunlight.
- B. Do not store plastic pipe or fittings in direct sunlight.
- C. Protect pipe, pipe fittings, and seals from dirt and damage.
- D. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.

1.8 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
 - 1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without receiving Architect's written permission.
- D. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.

- E. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate sanitary sewerage system connections to utility company's sanitary sewer. Obtain all necessary permits for pavement cuts, line taps, etc. from the authorities having jurisdiction.
- B. Coordinate force main connection to existing force main with Owner.
- C. Coordinate with interior building drainage systems.
- D. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work are specified herein. Products by other manufacturers having equal performance characteristics may be considered, however approval must be acquired by the Contractor from the Town of Kenansville.

2.2 PIPES AND FITTINGS

- A. Ductile-Iron Gravity Sewer Pipe & Fittings: AWWA C150 and C151, Pressure Class 350 with laying condition Type 1 (Type 4 for installations of greater than 16-ft of cover).
 - 1. Lining: AWWA C104, cement mortar, bituminous seal coated.
 - 2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
 - 3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
 - 4. Mechanical-Joint-Type Pipe: AWWA C111, rubber gaskets, ductile- or cast-iron glands, and steel bolts and nuts.
 - 5. Standard-Pattern, Ductile-Iron and Cast-Iron Fittings: AWWA C110, for push-on joints.
 - 6. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
 - 7. Coating: AWWA C151, bituminous coating.
- B. Polyvinyl Chloride (PVC) Gravity Sewer Main Pipe and Fittings: ASTM D 3034 for gasketed joints. PVC Pipe shall be solid wall and made of PVC plastic having a cell classification of 12454 or 12364 (with minimum tensile modulus of 400,000 psi) as defined in Specification D1784. PVC pipe shall have integral wall bell and spigot joints for the conveyance of domestic sewage and shall be supplied in minimum 14 or 20 ft lengths. Fittings shall be made of PVC plastic having a cell classification of 12454-B, as defined in ASTM D1784. Fittings must be manufactured by pipe supplier or approved equal, and have bell and/or spigot configurations compatible with that of the pipe. Compounds with superior properties are also acceptable.
 - 1. Thickness: SDR 35 for 4-ft to 12-ft installation depths.
 - 2. Thickness: SDR 26 for 12-ft to 30-ft installation depths.
 - 3. Gaskets: ASTM F 477, elastomeric seal.

- C. Polyvinyl Chloride (PVC) Gravity Sewer Service Pipe and Fittings: PVC service pipe shall be 4-in or 6-in, schedule 40 or greater supplied in minimum 18-ft lengths. Schedule 40 PVC pipe shall be manufactured with a cell classification of 12454 in conformance with ASTM D1784. Schedule 40 pipes shall be manufactured to dimensional tolerances as specified in ASTM D1785 and rated for service conditions up to temperatures of 140-degrees Fahrenheit. The pipe may be joined by solvent weld in conformance with ASTM D2564.

2.3 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined, for nonpressure joints.
 - 1. Sleeves for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 - 3. Sleeves for Plastic Pipe: ASTM F 477, elastomeric seal.
 - 4. Sleeves for Dissimilar Pipes: Compatible with pipe materials being joined.
 - 5. Bands: Stainless steel, at least one at each pipe insert.

2.4 CLEANOUTS

- A. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Light Duty: In earth or grass, foot-traffic areas.
 - 2. Medium Duty: In paved, foot-traffic areas.
 - 3. Heavy Duty: In vehicle-traffic service areas.
 - 4. Extra Heavy Duty: In roads.
- B. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, service class, cast-iron soil pipe and fittings.

2.5 MANHOLES

- A. Precast Concrete Manholes: ASTM C 478, 4,000-psi, precast, reinforced concrete, of depth indicated, with provision for rubber gasket joints and designed for H-20 loading.
 - 1. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent floatation.
 - 2. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.
 - 3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 - 4. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 - 5. Joints: Plastic cement putty meeting Fed Spec SS-S-00210 such as Ram-Nek or a butyl rubber sealant. All lift holes shall be filled with non-shrink grout.
 - 6. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match a 24-inch-diameter frame and cover.
 - 7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
 - 8. Steps: Polypropylene material reinforced with ½-inch diameter reinforcing bar. Steps shall be designed for a vertical load of 400-lbs and a horizontal pull-out load of 1,000-lbs. Holes for steps shall not project through the manhole wall. Steps shall be 11-3/8-in clear width and shall project

at least 5-in from manhole wall. Steps shall be located along the effluent side of the manhole with proper orientation of the manhole's eccentric cone section.

- B. Manhole Frames and Covers: ASTM A48, Class 35, cast iron. Include 22-1/4-inch inside diameter by 7-1/2-inch riser with 4-inch minimum width flange, and 23-1/2-inch- diameter cover. Include indented top design with Town of Kenansville symbol and "SANITARY SEWER" cast into cover.
 - 1. Manhole Frames and Covers in Paved Areas: For all installations in roadways, use Type 1 ring and cover, and place sufficient depth of concrete below the pavement around the ring to ensure contact with manhole. Type 1 covers shall be provided with 1 vent hole. Type 1 covers shall be designed for a proof load of 40,000 lbs. and provided in Class 35B gray iron in conformance with ASTM A48. At a minimum, type 1 manhole rings shall weigh 190 lbs. and the cover shall weigh 120 lbs.
 - 2. Manhole Frames and Covers for Outfalls: For installation in unpaved areas, with 4-ft and 5-ft diameter manholes use Type 2 ring and cover. Type 2 covers shall not be installed in areas subject to traffic loading. Type 2 covers shall be provided with an integrated frame and cover assembly in which the cover rotates away from the frame for access. The rotating assembly shall be provided with a cast in stainless steel rod assembly. Type 2 covers shall be provided with a minimum 24-inch clear span opening along the axis with the stainless steel rod assembly. Security shall be provided by 3 exterior cast lugs at 3/4-inch thickness that allow padlock installation or bolting with 3 stainless steel bolts with stainless steel zinc plated nuts. Type 2 covers shall be made of Class 35B iron in conformance with ASTM A48 and designed for a proof load of 12,000 lbs. The frame and cover weight shall not be less than 60-lbs for the cover and 80-lbs for the ring.

2.6 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Structures: Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.

PART 3 - EXECUTION

3.1 GENERAL

- A. All construction shall conform to the Standard Specifications and Details of the Town of Kenansville and the NCDOT as applicable in addition to the requirements state herein.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures. Locate 6 inches to 24 inches below finished grade, directly over piping.

3.4 SEWERAGE PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products. Refer to the drawings type of pipe to be installed.

3.5 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground sewerage piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use proper size increasers, reducers, and couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- D. Install gravity-flow-systems piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated.
- E. Extend gravity sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
- F. Install gravity sewerage piping pitched down in direction of flow, at minimum and cover as indicated.
- G. Tunneling: Install pipe under streets or other obstructions, that cannot be disturbed, by tunneling, jacking, or a combination of both.
- H. PVC Sewer Service Pipe shall be installed at no less than 4-ft of cover and shall be installed with 4-in minimum stone bedding extended to the springline. PVC sewer service pipe installed with greater than 8-ft of cover shall be bedded on 6-in of stone extended above the pipe crown.
 - 1. Ductile iron pipe shall be used for sanitary sewer services with less than 4-ft of cover or in excess of 20-ft of cover.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to the following.
- B. Ductile-Iron Pipe with Ductile-Iron or Cast-Iron Fittings: With push-on-joint, rubber gaskets according to AWWA C600.

- D. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: Installation of PVC pipe shall follow the recommendations of ASTM D-2321 "Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications". For PVC pipe installation, bedding and embedment material shall be Class I, typically No. 67 or No. 78 washed stone. Bedding and embedment materials for PVC gravity sewers other than No. 67 or No. 78 washed stone shall be approved by the Town of Kenansville prior to use.
1. Typical Bedding and Embedment for SDR35 PVC Gravity Sewers, 4-ft to 14-ft in Depth: Bedding shall consist of minimum 4-inches of No. 67 or No. 78 stone installed under the pipe extending up to the springline. Bedding and embedment shall be compacted to 95% standard proctor density. Careful attention shall be placed on compacting embedment under the haunches of the pipe to prevent any potential voids.
 2. Typical Bedding and Embedment for SDR26 PVC Gravity Sewers, 14-ft to 30-ft in Depth: Bedding shall consist of minimum 6-inches of No. 67 or No. 78 stone installed under the pipe extending 6-inches above the crown of the pipe. Bedding and embedment shall be compacted to 95% standard proctor density. Careful attention shall be placed on compacting embedment under the haunches to prevent any potential voids.
 3. The bedding and embedment materials shall be in accordance with ASTM D-2321. The embedment materials shall be installed from trench wall to trench wall.
 4. The maximum allowable deflection after installation shall BE LESS THAN 5% for PVC pipe.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with accessories, as indicated.
- B. Form continuous concrete channels and benches between inlets and outlet, where indicated.
- C. Set tops of frames and covers flush with finished surface where manholes occur in pavements. Set tops 3 inches above finished surface elsewhere, except where otherwise indicated.
- D. All manholes in roadways shall be encased in a 3,000-psi concrete collar beneath the asphalt.
- D. Place precast concrete manhole sections as indicated, and install according to ASTM C 891.
 1. Provide joint gasket at joints of sections.
 2. Apply bituminous mastic coating at joints of sections.
 3. Patch all lift holes with non-shrink grout.

3.8 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Sewer cleanouts located in paved areas, which bear vehicle loading, must have ductile iron risers, ductile iron fittings and traffic rated cast iron cover assembly.
- B. Set cleanout frames and covers in earth in a cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade. Precast cleanout collars shall not be used.
- C. Set cleanout frames and covers in concrete paving with tops flush with surface of paving.

3.9 FIELD QUALITY CONTROL – GRAVITY SEWER

- A. Visual Testing and Observation

1. All materials used must be approved by the Inspector prior to installation. Rejected materials shall be immediately removed from the job.
 2. Gravity sanitary sewer lines shall be clean and free from obstructions, and shall be visually inspected from every manhole. Lines which do not exhibit a true line and grade or which have structural defects shall be corrected. Sanitary sewer service connections shall be visually inspected prior to backfilling.
- B. Air Testing: Low-pressure air testing in accordance with ASTM F1417 shall be performed on all sewer mains before the laterals or stubs are installed on the line, and after the trench has been backfilled to finished grade
1. Plugs shall be installed at each manhole to seal off the test section. The line will be pressurized with a single hose and monitored by a separate hose connection from the plug.
 2. Air then shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0 psig. The air pressure shall then be allowed to stabilize for a minimum of 2 minutes at no less than 3.5 psig (plus groundwater pressure, if any).
 3. When the pressure reaches 3.5, the time required for the pressure to drop 1.0 psi will be observed and recorded.
 4. The line shall be "acceptable" if the pressure does not drop more than 1.0 psi in the time prescribed for the test in the Sanitary Sewer Air Test table found in the Town of Kenansville Standard Details.
 5. If the section fails to meet these requirements, the source of leakage shall be repaired and the pipe section re-inspected
 6. The Inspector may require that an infiltration test be performed that shall not exceed 100 GPD/inch/mile.
- C. Deflection Testing for PVC Pipe.
1. The mandrel (go/no-go) deflection test shall be performed on each line prior to acceptance and no sooner than 30 days after installation. The pipeline shall be thoroughly clean and free of debris and/or sediment prior to testing.
 2. The Contractor shall supply the mandrel used for this performance test. The mandrel device shall be cylindrical in shape having 9 possible contact points with the pipe. The mandrel's length and diameter (ID of proving ring) shall be in accordance with the following, and shall be subject to the Inspector's approval.
 - a. 8-in SDR-35 Pipe Mandrel: Length = 10-in; diameter = 7.329-in.
 - b. 8-in SDR-26 Pipe Mandrel: Length = 10-in; diameter = 7.496-in.
 3. The mandrel shall be advanced through the pipeline to determine if bedding and embedment has been provided in compliance with ASTM D2321 to assure joint deflection of less than 5%. If the mandrel becomes obstructed for any reason while being pulled through the line with less than 100-lbs of force, the location of the defect shall be noted and the mandrel shall be removed from the pipeline.
 4. Under no circumstances shall heavy equipment be utilized to force the mandrel through the pipeline.
 5. Deflection testing may be done concurrently with sewer televising inspections, provided the mandrel is kept within visible range of the camera.
- D. Video Assessment and Cleaning
1. As a final measure required for acceptance, the Contractor shall clean and televise all newly installed sewer mains prior to acceptance by the Town of Kenansville and Owner. The Contractor

- shall televise the sewer main and all lateral connections installed from the upstream to downstream manhole with no reverse setups or cutaways.
2. Throughout shooting, the camera shall be panned and tilted for a complete view of the main. Lighting shall be adequate to view the entire sewer main and service connections from beginning to end.
 3. The video inspection shall be submitted to the Civil Engineer and Inspector on a CD and formatted with software compatible and readable by the Town and Engineer. The Town and Engineer shall not be responsible for purchasing additional software necessary to view the CD's.
 4. The camera shall be advanced at a uniform rate that allows a full and thorough inspection of the new sewer main. The camera shall be a color, pan and tilt camera. The picture quality and resolution shall be acceptable and sufficient to allow a complete inspection with no lapses in coverage. The length of the sewer main shall be measured and recorded on the video screen. The distance counter shall be calibrated before shooting the inspection video.
 5. The Contractor shall clean the sewer mains ahead of video inspection with a high-velocity water jet. The video inspection shall take place within 2-hours of cleaning operations as witnessed by the Inspector. All construction debris shall be collected in the downstream manhole and shall not be released into the sewer system.
 6. The Inspector shall be present throughout the cleaning and televising of the sewer mains to verify that the video work complies with the specifications.
 7. Prior to submitting the CD's to the Inspector, the Contractor shall label the CD's with the following information:
 - a. Name of the Project/Development.
 - b. Name and contact information of responsible party.
 - c. Date of televising.
 - d. Manhole identification as shown on the design plans.
- E. Manhole Vacuum Testing: All newly installed manholes shall pass a vacuum test in accordance with ASTM C 1244-02. The Contractor shall supply all equipment and materials necessary to vacuum test the manholes.
1. Vacuum Testing shall not be initiated until the manholes and all specified coatings and lining materials have been cured in accordance with manufacturer recommendations.
 2. The Inspector shall be present and witness all vacuum testing.
 3. The following vacuum testing criteria shall apply for compliance with the testing procedure.
 4. A vacuum of 10-inches of mercury shall be drawn with an approved vacuum testing unit.
 5. The testing time shall not be measured until after the vacuum pump has been shut off .
 6. The time required for the vacuum to drop from 10-inches to 9-inches of mercury shall meet or exceed the values listed in the following table.

Manhole Vacuum Testing Time			
Depth	Manhole Diameter (in)		
(ft)	48	60	72
	Time (sec)		
8	20	26	33
10	25	33	41
12	30	39	49
14	35	48	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89

24	59	78	97
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END OF SECTION 333000

SECTION 334000 - STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes site drainage systems outside the building. Systems include the following:
 - 1. Storm drainage.
 - 2. Foundation drainage connections outside of building.
 - 3. Roof drainage connections outside of building.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 31 Section "Earth Moving."
 - 2. Division 31 Section "Erosion Controls."
 - 3. Division 03 Section "Cast-In-Place Concrete."
 - 4. Division 22 Sections for storm drainage inside the building.

1.3 DEFINITIONS

- A. Drainage Piping: System of pipe, fittings, and appurtenances for gravity flow of storm drainage.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. As-Built Survey / Record drawings at Project closeout of installed drainage system piping and basins and all stormwater management devices (ponds, wetlands, bio-retention areas). As-built survey shall be signed and seal by a NC Professional Land Surveyor and shall include the following:
 - 1. All basin locations with no less than two primary reference dimensions from permanent above grade features.
 - 2. As-built rims and inverts noted.
 - 3. Pipe materials and sizes, plus slopes and distances between structures.
 - 4. As-built dimensions for installed riprap dissipater pads.
 - 5. Topography of embankments and interiors of drained stormwater management ponds, wetlands and bio-retention cells. Topography shall include all survey point elevations.
 - 6. Detailed as-built dimensions and elevations of stormwater management device outlet structures, weirs, orifices, and outlet pipes.
 - 7. Stormwater treatment devices locations and elevations.

1.5 QUALITY ASSURANCE

- A. Environmental Agency Compliance: Comply with regulations pertaining to storm drainage systems.

- B. Utility Compliance: Comply with regulations pertaining to storm drainage systems.
- C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific manufacturer types indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 01 Section "Products."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures in direct sunlight.
- B. Do not store plastic pipe or fittings in direct sunlight.
- C. Protect pipe, pipe fittings, and seals from dirt and damage.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
 - 1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without receiving Architect's written permission.
- D. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of work.
- E. The location of existing underground utilities indicated are approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated on the drawings.
 - 1. Hire a private utility locating company and /or utilize "NC one call" by calling 1-800-632-4949 prior to the start of work for assistance in the location of existing underground utilities.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate storm drainage system connections to utility company's storm sewer.
- B. Coordinate storm drainage system connections to existing on-site storm sewer.
- C. Coordinate with interior building drainage systems.
- D. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

- A. General: Refer to plans for specific pipe material applications.
- B. Ductile-Iron Pipe: ANSI/AWWA C150/A21.50 and C151/A21.51, minimum pressure class 250.
 - 1. Lining: AWWA C104, cement mortar, coal tar epoxy lined.
 - 2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
 - 3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
 - 4. Coating: AWWA C151, bituminous coating.
- C. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D-1785, SCH 40 PVC for solvent-cemented or gasketed joints.
 - 1. Primer: ASTM F 656.
 - 2. Solvent Cement: ASTM D 2564.
 - 3. Gaskets: ASTM F 477, elastomeric seal.
- D. Reinforced-Concrete Sewer Pipe and Flared End Sections: ASTM C 76, Class III.
 - 1. Standard Joints: Mortar or plastic cement putty seal meeting Federal Specification SS-S-00210.
 - 2. Watertight Joints: O-ring rubber gasket meeting ASTM C-443. Watertight joints shall be provided at outlet pipes that penetrate pond embankments and other locations specified on the drawings.
- E. High Density Polyethylene (HDPE) Pipe and Fittings: AASHTO M252, M294, MP6, or MP7. Smooth interior and corrugated exterior. All sizes shall conform to the AASHTO classification Type S or D. N-12 or N-12HC by ADS or approved equal.
 - 1. Standard Joints: Silt-tight, rubber gasket, ASTM F477, bell and spigot.
 - 2. Watertight Joints: Watertight per ASTM D3212, AASHTO M294, MP6 or MP7, bell and spigot, rubber gasket, ASTM F477.
 - 3. Fittings: AASHTO M252, M294, MP6 or MP7, welded on the interior and exterior at all junctions. Only fittings supplied or recommended by the pipe manufacturer shall be used.

2.2 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Connection from roof downspout to underground storm pipe.
 - 1. Cast-Iron boot fitting sized to fit over downspout and underground piping. Appropriately sized Neenah R-4926-29 Series Downspout Shoe or approved equal.
 - 2. Vertical stainless steel downspout adapter with sch. 40 PVC pipe outlet sized to fit over downspout and underground piping. Adapter shall have a self-cleaning debris trap consisting of a hinged cover and removable debris screen. Powder-coat color to be selected by Architect from manufacturer's full range of colors. As manufactured by Piedmont Pipe Construction.
 - 3. Manufactured fitting of material similar to downspout sized to connect to standard round pipe shape of underground piping.

2.3 DRAINAGE INLETS

- A. Catch Basins and Drop Inlets: Brick and mortar, of depth, shape, and dimensions indicated. Precast concrete basins may be used in lieu of brick upon approval by the Architect. All structures shall be designed to withstand AASHTO H-20 loads.
 - 1. Base, Channel, and Bench: Concrete.

2. Wall: ASTM C 32, Grade MS, clay brick masonry units.
 - a. Option: ASTM C 55, Grade S-II, solid concrete brick masonry units may be used instead of clay brick.
 3. Mortar: ASTM C 270, Type S, using ASTM C 150, Type I, portland cement.
 4. Grout for Pond/Wetland/BMP Installations: ASTM C1107, non-shrink, hydraulic cement grout.
- B. Frames and Grates: ASTM A48, Class 35B, cast iron, H-20 loading. Include flat grate with small square or short-slotted drainage openings as indicated on the drawings. Provide grate with openings compliant with ADA standards when located within sidewalk or other pedestrian walking areas or where specifically indicated on drawings.
- C. Floor Drains: 12-inch diameter top drain, Dura-Coated cast iron body with 6-inch bottom outlet, seepage pan, adjustable extension frame and medium duty slotted grate. Top shall be polished nickel bronze and secured with slotted screws.
- D. Area Drains or Planter Drains: 15-inch square top drain designed to be attached with a watertight connection to vertical HDPE or PVC pipe, ductile iron slotted surface grate, watertight pipe adapters. Grates shall be pedestrian-type where set in pavement or sidewalk. Grates shall be dome-type where set in mulched areas.

2.4 MANHOLES

- A. Precast Concrete Storm Drainage Manholes: ASTM C-478 precast reinforced concrete, eccentric cone. All structures shall be designed to withstand AASHTO H-20 loads.
1. Base, Channel, and Bench: Concrete.
 2. Joint: Preformed flexible plastic gaskets complying with Fed. Spec. SS-S-210A.
 3. Size: As required to accommodate proposed pipes indicated on the drawings, 4-ft diameter minimum.
- B. Frames and Covers: ASTM A48, Class 35B, heavy-duty cast iron. Include flat, round grate with 1-1/2" wide slotted drainage openings with a minimum total open area of 150-sq.in.

2.5 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C 150, Type I, 3,000-psi.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Structures: Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.

2.6 FOUNDATION DRAIN PIPING

- A. Foundation and Under Slab Drain Pipe and Fittings: ASTM D-1785, SCH 40 PVC with slotted perforations located in bottom half of pipe. Minimum 4-inch diameter unless otherwise indicated on the drawings.

- 1. Filter Fabric: Non-woven geotextile drainage fabric per Division 31, Section "Earth Moving."

2.7 STORM PIPE SUB-DRAIN PIPING

- A. Storm Pipe Sub-Drain Pipe and Fittings: SCH 40 PVC, with slotted perforations located in bottom half of pipe. Minimum 4-inch diameter unless otherwise indicated on the drawings.

- B. Filter Fabric: Non-woven geotextile drainage fabric per Division 31, Section "Earth Moving."

2.8 CLEANOUTS

- A. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

- 1. Light Duty: In earth or grass, foot-traffic areas.
 - 2. Medium Duty: In paved, foot-traffic areas.
 - 3. Heavy Duty: In vehicle-traffic service areas.
 - 4. Extra Heavy Duty: In roads.

2.9 TRENCH DRAINS

- A. Description, General: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total lengths indicated.

- B. Sloped-Invert, Polymer-Concrete Systems: Include the following components:

- 1. Channel Sections: Interlocking-joint, precast, modular units with end caps. Include extension sections necessary for required depth.
 - 2. Grates with manufacturer's designation "medium duty, heel proof," with slots or perforations that fit recesses in channels.
 - 3. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

- C. Refer to drawings trench drain sizes and types.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31, Section "Earth Moving."

3.2 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where indicated and where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

3.3 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground drainage systems piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use proper size increasers, reducers, and couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- D. Extend drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
- E. Install drainage piping pitched down in direction of flow, at minimum slope of 1 percent and 36-inch minimum cover, except where otherwise indicated.
- F. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: As follows:
 - 1. Join solvent-cement-joint pipe and fittings with solvent cement according to ASTM D 2855 and ASTM F 402.
 - 2. Join pipe and gasketed fittings with elastomeric seals according to ASTM D 2321.
 - 3. Join profile sewer pipe and ribbed drain pipe and gasketed fittings with elastomeric seals according to ASTM D 2321 and manufacturer's written instruction.
 - 4. Install according to ASTM D 2321.
- G. Install HDPE pipe in accordance with ASTM D2321 with the exception that minimum cover in trafficked areas shall be 12-inches.
 - 1. Slightly scarify and grade the trench base to provide a uniform trench bottom. Before installing pipe, bring bedding material or trench bottom to grade along the entire length of the pipe. For 42" pipe and larger, shallow bell holes shall be provided.
 - 2. Trench width shall be wide enough to accommodate compaction equipment. Refer the manufacturer's recommendations. Pipe backfill to springline shall be compacted to 95% Standard Proctor density regardless of pipe location.
 - 3. Excessive groundwater necessitates dewatering. Pipe will float in standing water, requiring immediate haunching and initial backfill to hold line and grade.
 - 4. Join pipe per manufacturer's instructions.
- H. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and fit both systems' materials and dimensions.

3.4 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.
- C. Install prefabricated area drains per manufacturer's instructions.

3.5 STORMWATER TREATMENT DEVICE INSTALLATION

- A. Install in accordance with the site plans and the manufacturer's detail drawings and installation instructions. Install device on a base of 8-in thick aggregate base course over compacted subgrade.
- B. Test device for water tightness prior to backfilling.

3.6 SUBSURFACE STORMWATER DETENTION SYSTEM INSTALLATION

- A. Subsurface stormwater detention system components shall be installed in accordance with the manufacturer's written instructions on a properly prepared subgrade. Install specified sealant material and joint wrap to form soil tight joints.

3.7 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either of the following procedures:
 - 1. Close open ends of piping with at least 8-inch-thick brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Structures: Excavate around structure as required and use either of the following procedures:
 - 1. Remove structure and close open ends of remaining piping.
 - 2. Backfill to grade according to Division 31, Section "Earth Moving."

3.8 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as the work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and whenever work stops.
 - 3. Flush piping between manholes and other structures, if required by authorities having jurisdiction, to remove collected debris.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of the Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visual between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of a ball or cylinder of a size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- C. All HDPE pipe and fittings 12-inch in diameter and greater shall be inspected by the pipe supplier/manufacturer following delivery to the construction site for damage caused during transit. Damaged or defective materials shall be removed from the site. A record of this inspection(s) shall be submitted to the Architect. Contractor shall supply documentation of experience in the installation of HDPE storm drainage pipe or shall provide for installation supervision by the supplier/manufacturer.
- D. Test new piping systems and parts of existing systems that have been altered, extended, or repaired for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction.
 3. Schedule tests, and their inspections by authorities having jurisdiction, with at least 24 hours' advance notice.
 4. Submit separate reports for each test.

END OF SECTION 33 30 00

SECTION 347113 - VEHICLE BARRIERS - PLASTIC SECURITY POST COVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Accessories
 - 2. Plastic bollard covers.
- B. Related Requirements:
 - 1. Division 05 Section "Metal Fabrications" for metal bollards.

1.3 SUBMITTALS

- A. Product Data: Provide for each type of product specified.
- B. Maintenance Data: Submit manufacturer's field touch-up, cleaning, and maintenance instructions.
- C. Warranty Documentation: Submit sample of manufacturer's warranty.

1.4 QUALITY ASSURANCE

- A. Comply with Division 01 Quality Control Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect bollards and accessories during delivery, storage, and handling.

1.6 WARRANTY

- A. Provide manufacturer's standard warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ideal Shield.
 - 2. Post Guard | Encore Commercial Products, Inc.
 - 3. Reliance Foundry Co. Ltd.

2.2 ACCESSORIES:

- A. Self-adhesive foam strips.
- B. Self-adhesive neoprene tape.
- C. Reflective Tape: 2 strips of reflective tape, recessed on bollard.

2.3 PLASTIC BOLLARD COVERS

- A. Materials:
 - 1. Formolene HB5502B, High Density Polyethylene (HDPE); Hexene Copolymer for Blow Molding.
 - a. High molecular weight material. Designed for optimum balance of density, molecular weight and molecular weight distribution demonstrating maximum property advantages for large products that require high impact resistance.
 - b. Ultraviolet protection additive.
 - c. Anti-Static Package: Combined in manufacturing process of HDPE.
 - d. Abrasion Resistant.
 - e. Environmental Stress Cracks Resistant.
 - f. Flexural modulus: 200,000 psi.
 - g. Tensile Strength: 4,000 psi.
- B. Plastic Bollard Cover:
 - 1. Height: Refer to drawings.
 - 2. Base Diameter: Refer to drawings.
 - 3. Top: Flat top.
 - 4. Maximum Interior Post Height: Refer to drawings.
 - 5. Maximum Interior Post Diameter: Refer to drawings.
 - 6. Material: High Density Polyethylene (HDPE)
 - 7. Color: Yellow
 - 8. Tape Color: White.
 - 9. Installation: Security post, self-adhesive foam strips.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine paving or other substrates for compliance with manufacturer's requirements for placement and location of embedded items, condition of substrate, and other conditions affecting installation of bollards.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's installation instructions and setting drawings.
- B. Do not install damaged, cracked, chipped, deformed, or marred bollards. Field touch-up minor imperfections in accordance with manufacturer's instructions. Replace bollards that cannot be field repaired.

- C. Plastic Bollard Covers: Install over foam strips in pattern indicated in manufacturer's instructions.

3.3 CLEANING & PROTECTION

- A. Protect bollards against damage.
- B. Immediately prior to Substantial Completion, clean bollards in accordance with manufacturer's instructions to remove dust, dirt, adhesives, and other foreign materials.
- C. Touch up damaged finishes according to manufacturer's instructions.

3.4 CLOSEOUT ACTIVITIES

- A. Provide executed warranty.

END OF SECTION 347113

SECTION 43 41 11 – GLASS-COATED BOLTED STEEL POTABLE WATER TANKS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Furnish and erect a glass-coated, bolted-steel water storage tank, including foundation, tank structure and tank appurtenances as shown on the contract drawings and described herein.
 - a. All required labor, materials and equipment shall be included.
- B. Qualifications of Tank Supplier
 - a. The Engineer's selection of factory applied glass- fused-to-steel bolt together tank construction for this facility has been predicated upon the design criteria, construction methods specified, and optimum coating for resistance to internal and external tank surface corrosion. Deviations from the specified design, construction or coating details, will not be permitted.
 - b. The bidder shall offer a new tank structure as supplied from a U.S.A. manufacturer specializing in the design, fabrication and erection of factory applied glass-fused-to-steel, bolt together tank systems. The manufacturer shall own and operate its production plant, fabricate and glass coat the tank at one U.S.A. location. Steel used for the tanks shall be smelted and produced in the U.S.A.
 - c. The tank shown on the contract drawings and specified herein is a Model 3633 Aquastore Tank System as manufactured by CST Industries, Inc. of DeKalb, Illinois.
 - 1) Alternate Manufacturers:
 - a. Fisher
 - b. United Industries
 - d. Alternate glass-fused-to-steel tank products, as provided by other manufacturers, will be considered for prior approval by the Engineer. Manufacturers lacking the experience requirement will not be considered. The Owner's decision or judgment on these matters will be final, conclusive and binding.
 - e. Strict adherence to the standards of design; fabrication; erection; product quality; and long term performance, established in this Specification will be required by the Owner and Engineer.
 - 1) Tank or Dome substitutions which cause engineering and contract changes - the tank installation as shown on the plans and specified herein, is based on the equipment furnished by one manufacturer. A tank which is offered as a substitute to the specific requirements of these Specifications and which differs in detail and arrangement from that shown may require changes in design and construction. All costs which result from such changes in design and construction are to be borne entirely and unconditionally by the Contractor; said costs to included but not be limited to structural, piping, mechanical and electrical changes and all engineering costs incurred as a result of the substitution, in the revision of Plans and Specifications, review of design changes by others, preparation of change orders, and any other costs directly resulting from said substitution.
 - f. Tank suppliers wishing to pre-qualify shall submit the following to the Engineer/Owner for consideration 14 days prior to bid date.
 - 1) Typical structure and foundation drawing(s).
 - 2) List of tank materials, appurtenances and tank coating specs.
 - 3) List of five (5) tanks presently in U.S.A. potable water service, of size and character specified herein, operating satisfactorily for a minimum of five (5) years, including the name and telephone number of Owner and Engineer. The tanks listed shall have been manufactured in the present production facility; not by a predecessor company in a different facility.
 - 4) Certification from tank manufacturer that the tank meets all of tank design standards listed in Section 2.0.

- g. The Engineer reserves the right to evaluate all bids based on long term, 30 year minimum operation, coating and maintenance costs. Values to be used in this evaluation will be at the discretion of the Engineer, as detailed in this specification and bid tabulation form. The Engineer will add such costs, dependent upon the type of tank offered, to the bidder's bid price to determine the effective low bid for purposes of making the award.
- C. Submittal Drawings and Specifications
 - a. Construction shall be governed by the Owner's drawings and specifications showing general dimensions and construction details, after written approval by the Engineer of detailed erection drawings prepared by the tank bidder. There shall be no deviation from the drawings and specifications, except upon written order from the Engineer.
 - b. The bidder is required to furnish, for the approval of the Engineer and at no increase in contract price, two sets of complete specifications and construction drawings for all work not shown in complete detail on the bidding drawings. A complete set of structural calculations shall be provided for the tank structure and foundation. All such submissions shall be stamped by a Registered Professional Engineer licensed in the state of project location, as well as, by a Registered Professional Engineer employed on the tank manufacturer's engineering staff.
 - c. When approved, two sets of such prints and submittal information will be returned to the bidder marked "APPROVED FOR CONSTRUCTION" and these drawings will then govern for the work detailed thereon. The approval by the Engineer of the tank supplier's drawings shall be an approval relating only to their general conformity with the bidding drawings and specifications and shall not guarantee detail dimensions and quantities, which remains the bidder's responsibility.
 - d. The tank manufacturer's and installing contractor's standard published warranty shall be included with submittal information.

1.2 DDESIGN CRITERIA

- A. Tank Size
 - a. The factory coated glass-fused-to-steel, bolt together tank shall have a nominal diameter of 33.56 feet, with a nominal sidewall height (to roof eave) of 33.01 feet.
- B. Tank Capacity
 - b. Tank capacity shall be 218,000 gallons (nominal, U.S. gallons).
- C. Floor Elevation
 - c. Finished floor elevation shall be set at Elevation 139.25 FT.
- D. Tank Design Standards
 - a. The materials, design, fabrication and erection of the bolt together tank shall conform to the AWWA Standard for "Factory Coated Bolted Steel Tanks For Water Storage" - ANSI/AWWA D103, latest revision. NFPA-22 Compliant.
 - b. The tank coating system shall conform solely to Section 10.4 of ANSI/AWWA D103. NOTE: Baked-on epoxy painted, galvanized, or stainless steel bolt-together tanks are not considered equal.
 - c. The vitreous coating on the tank, bolt head encapsulation material, and joint sealant shall have been approved for listing under ANSI/NSF Standard 61 for Indirect Additives.
 - d. The tank manufacturer shall be ISO-9001 certified to assure product quality.
 - e. The tank manufacturer shall undergo an annual FM (Factory Mutual) inspection of their glass-coated, bolted-steel tank factory & provide written proof thereof to assure quality.
- E. Design Loads
 - a. Specific Gravity 1.0 (Min. design shall be 1.0)
 - b. Wind Velocity 100 mph (AWWA D103 Std. 100 mph)
 - c. Shape Factor 0.6 (0.6 Std.)
 - d. Allowable Soil Bearing 3,000 psf (refer to geotechnical report)
 - e. Roof Snow Load 30 psf
 - f. Seismic per AWWA D103-97 Zone 1 Effective Mass Method.

PART 2- PRODUCTS

2.1 MATERIALS SPECIFICATIONS

- A. Plates and Sheets Note: All steel shall be smelted and produced in the U.S.A.
- Plates and sheets used in the construction of the tank shell, tank floor (optional) or tank roof (optional), shall comply with the minimum standards of AWWA D103, Section 2.4.
 - Design requirements for mild strength steel shall be ASTM A1011 Grade 30 with a maximum allowable tensile stress of 14,566 psi per AWWA D103.
 - Design requirements for high strength steel shall be ASTM A607 Grade 50 with a maximum allowable tensile stress of 25,400 psi per AWWA D103.
 - The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, Sections 3.4 and 3.5.
 - Multiple vertical bolt line sheets and plates of ASTM A607 Grade 50 only shall be manufactured such that holes are staggered in the vertical bolt lines and that no two adjoining holes are in-line horizontally, except at the center of the sheet or plate.
 - Bolt seam design shall generally be in accordance with the requirements of AWWA D103 section 3.5.2; bolt spacing may be adjusted in the vertical bolt lines to increase the net section and improve joint efficiency to a maximum of 85%.
 - Double sheeting of tank panels shall not be permitted to achieve structural sidewall thickness requirements.
- B. Rolled Structural Shapes
- Material shall conform to minimum standards of ASTM A36 or AISI 1010.
- C. Horizontal Wind Stiffeners
- Design requirements for intermediate horizontal wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffener, permitting wind load to transfer around tank.
 - Web truss stiffeners shall be of steel with hot dipped galvanized coating.
 - Rolled steel angle stiffeners are not permitted for intermediate stiffeners.
- D. Bolt Fasteners
- Bolts used in tank lap joints shall be 1/2" - 13 UNC- 2A rolled thread, and shall meet the minimum requirements of AWWA D103, Section 2.2.
 - Bolt Material
 - SAE Grade 2 (1" bolt length)
 - Tensile Strength - 74,000 psi Min.
 - Proof Load - 55,000 psi Min.
 - Allowable shear stress - 18,164 psi (AWWA D103).
 - SAE grade 8/ASTM A325 (> 1" bolt length) heat treated to:
 - Tensile Strength - 150,000 psi Min.
 - Proof Load - 120,000 psi Min.
 - Allowable shear stress - 36,818 psi (AWWA D103).
 - Bolt Finish - Zinc, mechanically deposited.
 - 2.0 mils minimum - under bolt head, on shank and threads
 - Bolt Head Encapsulation
 - High impact polypropylene co-polymer encapsulation of entire bolt head up to the splines on the shank.
 - Natural resin with UV (ultraviolet) light inhibitor. Color to be black.
 - All tank shell bolts shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.
 - All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between tank sheets. Also, bolt lengths shall be sized as to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.
 - All lap joint bolts shall include a minimum of four (4) splines on the underside of the bolt head at the

shank in order to resist rotation during torquing.

E. Sealants

- a. The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and meet applicable FDA Title 21 regulations, as well as, ANSI/NSF Additives Standard 61.
- b. The sealant shall be used to seal lap joints, bolt connections and sheet edges. The sealant shall cure to a rubber like consistency, have excellent adhesion to the glass coating, have low shrinkage, and be suitable for interior and exterior exposure.
- c. Sealant curing rate at 73° F and 50% RH
- d. Tack-free time: 6 to 8 hours.
- e. Final cure time: 10 to 12 days.
- f. The sealant shall be ESPC System Sealer No. 98.
- g. Neoprene gaskets and tape type sealer shall not be used.

2.2 GLASS COATING SPECIFICATION

A. Surface Preparation

- a. Following the decoiling and shearing process, sheets shall be steel grit-blasted on both sides to the equivalent of SSPC-10. Sand blasting and chemical pickling of steel sheets is not acceptable.
- b. The surface anchor pattern shall be not less than 1.0 mil.
- c. These sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.

B. Cleaning

- a. Sheet edges of sidewall and floor plates shall be mechanically rounded and flame coated with stainless steel prior to glass coating. Glass coating of the sheet edges shall be similar to the flat panel surfaces. The process shall be applied to all four sheet edges, and shall be equal to EDGECOAT™ by CST Industries, Inc.
- b. After edgecoating and prior to application of the coating system, all sheets shall be thoroughly cleaned by a caustic wash and hot rinse process followed immediately by hot air drying.
- c. Inspection of the sheets shall be made for traces of foreign matter or rust. Any such sheets shall be re-cleaned or grit-blasted to an acceptable level of quality.

C. VITRIUM PLUS™ Coating Technology

- a. All sheets shall be primed with catalytic nickel oxide glass ground-coat on both sides, and then air dried per section 10.4.2.1 of AWWA D103.
- b. A coat of milled glass shall be applied to the inside of the sheet and then air dried. This milled glass shall be formulated with titanium dioxide to produce a finished interior surface with optimum toughness and resistance to conditions normally found in potable water storage tanks.
- c. A second cover coat of the titanium dioxide formulated milled glass shall be applied to the interior surface. The finished interior color shall be white and have a minimum glass thickness of 10 mils.
- d. A final cover coat of milled cobalt oxide enhanced (blue) glass shall be applied to the exterior of the sheet.
- e. The sheets shall then be fired at a minimum temperature of 1500 degrees F in strict accordance with the manufacturer's ISO 9001 quality process control procedures, including firing time, furnace humidity, temperature control, etc.
- f. The finished exterior color shall be the manufacturer's standard cobalt blue.

D. Inspection

- a. All coated sheets shall be inspected for 10 mil minimum glass thickness (Mikrotest or equal).
- b. All coated sheets shall be checked for color uniformity by an electronic colorimeter.
- c. An electrical "holiday" detection test shall be performed on the inside surface after fabrication of the sheet. Only sheets with zero "holidays" shall be acceptable.

E. Packaging

- a. All approved sheets shall be protected from damage prior to packing for shipment.
- b. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.

- c. Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special wood pallets built to the roll-radius of the tank panels. This procedure eliminates contact or movement of finished panels during shipment.
- d. Shipment from the factory to the job site will be by truck, hauling the tank components exclusively. No common carrier, drop, or transfer shipments.

PART 3-EXECUTION

3.1 ERECTION

A. Foundation

- a. The tank foundation is a part of this contract.
- b. The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.
- c. Tank footing design shall be based on 3000 psf soil bearing capacity or greater as determined by geotechnical analysis performed by a licensed soils engineer. The cost of this investigation and analysis is not to be included in the bid price. Copies of the soils report are to be provided to the bidder prior to bid date by the Owner or Engineer.
- d. Footing designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturers standard shall be the responsibility of the Owner and his Engineer based on tank live and dead loading data provided by the tank manufacturer.

B. Tank Floor Options:

a. Concrete Floor (Standard)

- 1) The floor design is of reinforced concrete with an embedded glass coated steel starter sheet per AWWA D103-97 section 11.4.1.6 and the manufacturer's design, and is an integral element of the tank assembly; therefore the tank foundation and floor slab (performed in two separate pours) with embedded starter sheet shall be constructed by the tank supplier using manufacturer trained personnel regularly engaged in this type of tank construction.
- 2) Leveling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed one-eighth (1/8) inch, nor exceed one-sixteenth (1/16) inch within any ten (10) feet of length.
- 3) A leveling plate assembly (per Harvestore Products, Inc. - U.S. Patent No. 4,483,607), consisting of two 18" anchor rods (3/4" dia.) and a slotted plate (3 1/2" X 11" X 3/8" thk) shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted. The foundation with anchor bolts/leveling plates shall be a separate pour from the concrete floor.
- 4) Two water stop seals made of a butyl rubber elastomer special for this application shall be placed on the inside surface of the starter ring below the concrete floor line. These materials shall be installed as specified by the tank manufacturer.

b. (Optional) Glass Coated Bolted Steel Floor

- 1) (N/A) The floor design is of glass-coated, bolted steel. Bolted steel panels shall be either placed over a three (3) inch compacted sand base contained by a steel or concrete ring wall, or a non-extruding and resilient bituminous type filler meeting the requirements of ASTM D1751 if set on a concrete slab.
- 2) Polyethylene copolymer caps and sealant shall be used to cover the bolts, nuts and washers exposed on the inside of the floor.
- 3) Leveling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed one-eighth (1/8") inch, nor exceed one-sixteenth (1/16") inch within any ten (10ft) feet of length.

C. Sidewall Structure

- a. Field erection of the glass-coated, bolted-steel tank shall be in strict accordance with the procedures

outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks.

- b. Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.
- c. Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected by the Engineer.
- d. An electrical holiday test shall be performed during erection using a nine (9) volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer's published touch up procedure using urethane sealer.
- e. The placement of sealant on each panel may be inspected prior to placement of adjacent panels. However, the Engineer's inspection shall not relieve the bidder from his responsibility for liquid tightness.
- f. No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

D. Roof Options

- a. (N/A) Tanks with diameters of 14 to 31 ft. shall include a radially sectioned roof fabricated from glass-coated, bolted steel panels, as produced by the tank manufacturer, and shall be assembled in a similar manner as the sidewall panels utilizing the same sealant and bolting techniques, so as to assure a water/air tight assembly. The roof shall be clear span and self-supporting. Both live and dead loads shall be carried by the tank walls. The exterior coating finish shall be cobalt blue glass. The manufacturer shall furnish a roof opening which shall be placed near the outside tank ladder and which shall be provided with a hinged cover and a hasp for locking. The opening shall have a clear dimension of at least twenty-four (24") inches in one direction and eighteen (18") inches in the other direction. The opening shall have a gasketed weather-tight cover.
- b. (YES) Roofs for tanks greater than 31 ft. diameter shall be constructed of non-corrugated triangular aluminum panels which are sealed and firmly clamped in an interlocking manner to a fully triangulated aluminum space truss system of wide flange extrusions, thus forming a spherical dome structure.
 - 1) The dome shall be clear-span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring. The dome dead weight shall not exceed 3 pounds per square foot of surface area.
 - 2) The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.
 - 3) Materials:
 - a) Triangulated space truss: 6061-T6 aluminum struts and gussets.
 - b) Triangular closure panels: .050"t 3003-H16 aluminum sheet.
 - c) Tension ring: 6061-T6 aluminum.
 - d) Fasteners: 7075-T73 anodized aluminum or series 300 stainless steel.
 - e) Sealant and gaskets: silicone rubber.
 - f) Dormers, doors, vents and hatches: 6061-T6, 5086-H34 or 3003-H16 aluminum.

c. Roof Vent

- 1) A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum possible rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.5" water column.
- 2) The overflow pipe shall not be considered to be a tank vent.
- 3) The vent shall be constructed of aluminum.
- 4) The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen (1/2 inch) opening. An insect screen of 23 to 25 mesh polyester monofilament shall be

provided and designed to open should the screen become plugged by ice formation.

E. Appurtenances (per AWWA D103, Section 5)

a. Pipe Connections

- 1) Where pipe connections are shown to pass through tank panels, they shall be field located, saw cut, (acetylene torch cutting or welding is not permitted), and utilize an interior and exterior flange assembly. CST, Inc. Sealer No. 98 shall be applied on any cut panel edges or bolt connections.
- 2) Overflow piping shall be 8 inch diameter, 304 stainless steel nozzle and piping and shall have a stainless-steel mesh screened end.

b. Outside Tank Ladder

- 1) An outside tank ladder shall be furnished and installed as shown on the contract drawings.
- 2) Ladders shall be fabricated of aluminum and utilize grooved, skid-resistant rungs and include OSHA approved safety climbing device.
- 3) Safety cage and step-off platforms shall be fabricated of galvanized steel.
- 4) A hinged, lockable gate shall be installed at the base of the ladder safety cage to deter unauthorized access to the top of the tank. The owner shall provide and install the lock.

c. Sidewall Access Manway

- 1) One sidewall access manway shall be provided as shown on the contract drawings in accordance with AWWA D-103. (A second manway is required for NFPA-22 compliance.)
- 2) Such manway shall be a minimum of 24 inches in diameter and shall include a properly designed reinforcing frame and cover plate. A davit to hold the cover plate, when opened, is required for tanks in excess of 38' tall.

d. Identification Plate

- 1) A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior sidewall at a location approximately five (5') feet from grade elevation in a position of unobstructed view.

e. Cathodic Protection

- 1) A passive, sacrificial magnesium anode cathodic protection system shall be designed and supplied by the tank manufacturer.

PART 4-QUALITY ASSURANCE

4.1 FIELD TESTING

A. Hydrostatic

- a. Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow elevation.
- b. Any leaks disclosed by this test shall be corrected by the erector in accordance with the manufacturer's recommendations.
- c. Water required for testing shall be furnished by the owner at the time of tank erection completion, and at no charge to the tank erector. Disposal of test water shall be the responsibility of the owner.
- d. Labor and equipment necessary for tank testing is to be included in the price of the tank.

4.2 DISINFECTION

A. Standards

- a. The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Specification C652 "Disinfection of Water Storage Facilities" as modified by the tank manufacturer.
- b. Disinfection shall not take place until tank sealant is fully cured (10 to 12 days at 73° F/50% relative humidity).

- c. Acceptable forms of chlorine for disinfection shall be:
 - 1) Liquid chlorine as specified in AWWA C652.
 - 2) Sodium hypochlorite as specified in AWWA C652.
 - 3) Calcium hypochlorite (HTH) is not acceptable.
- d. Acceptable methods of chlorination per AWWA C652:
 - 1) Section 4.1.1.
 - 2) Section 4.1.2 - chemical feed pump only (4.1.2.I).
 - 3) Section 4.3.
 - 4) Section 4.2 is not acceptable.

SECTION 45 39 00 - FABRICATED EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.2 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 1860 Workbench, severe use, six feet (Ref. Part 2.1)
- B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

1.3 QUALITY ASSURANCE

- A. Equipment shall be manufactured by a manufacturer of established reputation with a minimum of five years experience performing similar fabrication techniques.

1.4 SUBMITTALS

- A. Shop Drawings shall be submitted in accordance with Division 1 - General Requirements of these specifications.

1.5 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 - General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

- A. Warrant work specified herein for one year from final acceptance against defects in materials, functions, and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.
- C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.1 WORKBENCH, SEVERE USE, SIX FOOT

Equipment Identifier: 1860

- A. Manufacturer's Reference:
 - 1. Fabricated item as shown on Equipment Layout Drawing.
- B. Overall Capacities/Dimensions/Weights:
 - 1. Overall weight, capacity, and dimensions:

Overall Dimensions		
Length	Width	Height
72"	32"	34"
Weight		Capacity
915 lb		2500 lb

- 2. Work surface thickness: 3/8 inch
- C. Features/Performance/Construction:
 - 1. Legs: Workbench legs shall be fabricated of 3 by 3 by 3/16 inch steel tube.
 - 2. Leg braces: Leg braces shall be 3 by 1/4 inch steel plate continuously welded to tubing.
 - 3. Top braces: Top braces shall be 3 by 3 by 1/4 inch steel angle with continuous electrical welds to tubing.
 - 4. Top: Top shall be 3/8 inch steel plate with 50 percent minimum electrical welds to top braces. Corners of top shall have a 2 inch radius for protection of personnel. All edges shall be ground smooth.
 - 5. Skid plate: Skid plate shall be 4 by 4 by 1/4 inches steel plate with continuous welds to tubing.
 - 6. Welds: All welds shall conform to American Welding Society standards.
- D. Finish: Cover all exposed steel surfaces including both sides of top, braces, and legs with one coat of zinc chromate primer and two coats of epoxy per manufacturer's recommendations in Owner's choice of color.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

- A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

- B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
 - 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
 - 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 - 3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
- C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

END OF SECTION 45 39 00