

PROJECT MANUAL



UNCW CIS BUILDING IMPROVEMENTS

SCO # 19-21380-01A

WILMINGTON, NORTH CAROLINA

BID DOCUMENTS
MAY 22, 2020



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Wilmington, North Carolina 28401
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LS3P Commission No. 7202-191372

PROJECT MANUAL
FOR
UNCW CIS BUILDING IMPROVEMENTS
WILMINGTON, NORTH CAROLINA



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NOTICE: This project manual, an unpublished instrument of service of the authors, is for use on this Project only and is prepared for use in conjunction with the authors' interpretations, observations, decisions and administration as described in Contract Documents, without which desired results can not be assured. Use in part or in whole for other purposes without the authors' expressed written consent may violate Act 17, United States Code, Paragraph 301, 1991.

CONSULTANT LIST
FOR
UNCW CIS BUILDING IMPROVEMENTS

CIVIL

McAdams
2905 Meridian Parkway
Durham, North Carolina 27713
Contact: Dave C. Toms, RLA
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Email: toms@mcadamsco.com



05/22/2020

STRUCTURAL

Woods Engineering, PA
254 North Front Street, Suite 201
Wilmington, North Carolina 28401
Contact: Don R. Woods, PE
Phone: 910.343.8007
Email: donwoods@woodseng.com



FIRE PROTECTION

Performance Based Fire Protection Engineering, PLLC
5520 Dillard Drive, Suite 130
Cary, North Carolina 27518
Contact: David Stacy, PE
Phone: 919.600.7780
E-Mail: dstacy@pbfpe.com

Specifications and Seal on Drawings

PLUMBING AND MECHANICAL

CBHF Engineers, PLLC
2246 Yaupon Drive
Wilmington, North Carolina 28401
Contact: David M. Hahn, PE
Phone: 910.791.4000
E-Mail: dhahn@cbhfengineers.com



ELECTRICAL

CBHF Engineers, PLLC
2246 Yaupon Drive
Wilmington, North Carolina 28401
Contact: W. Allen Cribb, PE
Phone: 910.791.4000
E-Mail: acribb@cbhfengineers.com



In cooperation with:

LS3P
101 N. Third Street, Suite 500
Wilmington, North Carolina 28401

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ADVERTISEMENT FOR BIDS

Sealed proposals for Single Prime Bids will be received until 3:00 pm on July 14, 2020 at The University of North Carolina Wilmington, Office of Facilities, 5150 Lionfish Drive, Wilmington, NC 28403, Attn: David Singley, for the construction of the UNCW CIS Building Improvements, Wilmington, NC (SCO # 19-21380-01A), at which time and place bids will be opened and read through video/audio conference.

Bidders must be pre-qualified to be eligible to submit bids and to have their bids considered.

The following licensed General Contractors have been pre-qualified by UNCW for this project:

1. Bordeaux Construction Co., Inc.
2. Holt Brothers Construction
3. MLB Construction Services, LLC
4. Monteith Construction Corp.
5. Muter Construction
6. TEAM Construction
7. Thomas Construction Group, LLC

An open virtual pre-bid meeting will be held for bidders, subcontractors and vendors via Zoom video teleconferencing on June 25, 2020 at 3:00 pm. The meeting will address project scope, description, issues, bidding procedures and forms, including MBE forms; and answer specific questions. Prime bidders are requested to attend.

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

1. Locks and Latches: Schlage L9000 series
2. Cylinders/Cores: Schlage Everest 7-pin Small Format Interchangeable Core
3. Panic Hardware: Von Duprin 98 Series
4. Keyed Removable Mullions: Von Duprin KR4954/9954 Series
5. Closers: LCN 4011/4111 Series

Complete plans, specifications and contract documents will be open for inspection in the offices of LS3P. Documents are also available for review in the Hispanic Contractors Association of Carolinas in Raleigh, North Carolina and East Coast Digital, 703 SE Greenville Blvd., Greenville, NC 27858 or can be obtained electronically on June 19, 2020. Go to <http://infoexchange.ls3p.com> and login using your e-mail address and "anonymous" as the password. Click on the UNCW CIS Building Improvements Bid Documents download link.

The state reserves the unqualified right to reject any and all proposals.

Signed: David Singley
Project Manager

University of North Carolina at Wilmington
(Owner)

NOTICE TO BIDDERS

Sealed proposals will be received by The University of North Carolina at Wilmington by David Singley, Project Manager, in Office of Facilities, 5150 Lionfish Drive, Wilmington, North Carolina 28403, up to 3:00 pm on July 14, 2020 and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment entering into the construction of:

CIS Building Improvements
The University of North Carolina at Wilmington
(SCO # 19-21380-01A)

In response to social distancing recommendations by state and local health authorities, bids will be opened publicly through video/audio conference.

1. Bids must be delivered via hand delivery, US Mail, UPS, or Federal Express.
2. To gain access to the virtual meeting:
 - a. Visit: <https://zoom.us/join>
 - b. Enter Meeting ID: 959 7810 8305
 - c. Enter Password: 722577
 - d. Click "Join" button.
 - e. Complete required "Meeting Registration" page fields.
 - 1) It is suggested that you Pre-Register prior to the meeting. This can be completed at any time and may avoid delays when signing into the meeting.
 - f. Click "Register" button when fields are complete.
 - g. If all required fields are completed, you will be directed to a "Meeting Registration Approved" page that will provide a summary of the meeting Topic, Time, Meeting ID and URL to join the meeting.
 - h. Click provided URL to join meeting.
 - i. Attendees must login to Zoom using a device equipped with a screen and microphone to view materials and/or presenters and communicate with others.
 - j. Bidders who want to be present at the bid opening must provide advance notice to Architect. Social distancing guidelines, as outlined by the CDC, NC DHHS, and the Governor's Office, will be strictly enforced for all bid opening attendees.

The project consists of:

1. Replace existing metal wall panels with wood wall panels.
2. Remove portions of wall beneath stair to create pass-through to space behind and small study room.
3. Remove solid wall at stair and replace with glass rail and wood handrail.
4. Replace metal cap at existing glass rail with wood cap.
5. Install acoustical panels at select vertical surfaces to aid in sound attenuation throughout lobby.
6. Remove existing canopy and add two-story terrace.
7. Associated electrical, fire protection and mechanical work.

Bidders must be pre-qualified to be eligible to submit bids and to have their bids considered.

The following licensed General Contractors have been pre-qualified by UNCW for this project:

1. Bordeaux Construction Co., Inc.
2. Holt Brothers Construction
3. MLB Construction Services, LLC
4. Monteith Construction Corp.
5. Muter Construction
6. TEAM Construction
7. Thomas Construction Group, LLC

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

Pre-Bid Meeting

An open virtual pre-bid meeting will be held for bidders and subcontractors via Zoom video teleconferencing on June 25, 2020 at 3:00 pm. The meeting will address project scope, issues, specific questions, bidding procedures, and bid forms. Prime bidders are requested to attend.

1. To gain access to the virtual meeting:
 - a. Visit: <https://zoom.us/join>
 - b. Enter Meeting ID: 944 3997 4858
 - c. Enter Password: 047815
 - d. Click "Join" button.
 - e. Complete required "Meeting Registration" page fields.
 - 1) It is suggested that you Pre-Register prior to the meeting. This can be completed at any time and may avoid delays when signing into the meeting.
 - f. Click "Register" button when fields are complete.
 - g. If all required fields are completed, you will be directed to a "Meeting Registration Approved" page that will provide a summary of the meeting Topic, Time, Meeting ID and URL to join the meeting.
 - h. Click provided URL to join meeting.
 - i. Attendees must login to Zoom using a device equipped with a screen and microphone to view materials and/or presenters and communicate with others.
2. Building Preview: Bidders are invited to conduct a self-guided walk-through of the building between the hours of 3:00 pm and 4:00 pm on Tuesday, June 30, 2020. Only one person per company will be allowed to walk the building. Bidders are reminded to observe social distancing and respect safety regulations regarding the COVID pandemic. Face masks are required.

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:

1. Locks and Latches: Schlage L9000 series
2. Cylinders/Cores: Schlage Everest 7-pin Small Format Interchangeable Core
3. Panic Hardware: Von Duprin 98 Series
4. Keyed Removable Mullions: Von Duprin KR4954/9954 Series
5. Closers: LCN 4011/4111 Series

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

Complete plans, specifications and contract documents will be open for inspection in the offices of LS3P. Documents are also available for review in the Hispanic Contractors Association of Carolinas in Raleigh, North Carolina and East Coast Digital, 703 SE Greenville Blvd., Greenville, NC 27858 or may be obtained electronically on June 19, 2020. Go to <http://infoexchange.ls3p.com> and login using your e-mail address and "anonymous" as the password. Click on the [UNCW CIS Building Improvements Bid Documents](#) download link.

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 Single Prime Building Contractor.

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 event 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 60 days.

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

Designer:

LS3P

Wilmington, North Carolina

910-790-9901

Owner:

The University of North Carolina at Wilmington

Wilmington, North Carolina

**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.

Twenty Fourth Edition January 2013

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.
- 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 all equipment 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 its 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 INSTRUCTIONS TO BIDDERS
AND SUPPLEMENTARY GENERAL CONDITIONS

The following Supplementary Instructions to Bidders and Supplementary General Conditions modify, delete from or add to the Instructions to bidders and General Conditions of the Contract Form OC-15 (Twenty-Fourth Edition, January 2013). Where any article of the Instructions to Bidders or General Conditions is modified or any paragraph, sub-paragraph or clause thereof is modified or deleted by these Supplements, the unaltered provisions of that article, paragraph, or sub-paragraph or clause shall remain in effect.

MODIFICATIONS OF THE INSTRUCTIONS TO BIDDERS

ITEM 6 - OPENING OF BIDS

(REVISE THIRD SENTENCE TO READ AS FOLLOWS):

After the opening of bids, no bid may be withdrawn, except under the provisions of General Statute 143-129.1, for a period of sixty days unless otherwise specified.

MODIFICATIONS OF THE GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS

(PARAGRAPH "a": ADD THE FOLLOWING TO THE END OF THE PARAGRAPH):

- a. The Geotechnical Technical Report does not constitute part of the Contract Documents but is included for reference.

(PARAGRAPH "c": ADD THE FOLLOWING):

- c. The designers are LS3P, McAdams, Woods Engineering, CBHF and Performance Based Fire Protection Engineering.

(PARAGRAPH "h": ADD THE FOLLOWING):

- h. The project name is UNCW CIS Building Improvements.

(ADD PARAGRAPH "cc" AS FOLLOWS):

- cc. Project Identification: All correspondence, reports, schedules, applications for payment, fax items, etc. shall contain proper title of project, code, item and SCO ID numbers, typical.

(ADD PARAGRAPH "dd" AS FOLLOWS):

- dd. "Latest edition" shall mean the current printed version of the referenced document issued up to 30 calendar days prior to date of receipt of bids, unless specified otherwise.

(ADD PARAGRAPH "ee" AS FOLLOWS):

- ee. "Drawings" or "plans" shall mean the drawings enumerated in the contract documents, as well as all the information in the detail manual (when applicable), addenda, and designer-prepared field drawings and clarification drawings.

(ADD PARAGRAPH "ff" AS FOLLOWS):

ff. "Specifications" mean this project manual and addenda thereto.

ARTICLE 2 - INTENT AND EXECUTION OF THE DOCUMENTS

(PARAGRAPH "a": ADD THE FOLLOWING SUBPARAGRAPHS):

1. These drawings and specifications represent the general dimensional and aesthetic requirements for various "in place" materials required to produce building improvements acceptable to the owner for his intended use.
2. It is the intent of these drawings and specifications to provide building improvements and associated appurtenances that are structurally sound and conforming to at least the minimum requirements of the North Carolina State Building Code.
3. The Contractor shall make all reasonable efforts to achieve this intent. If any detail shown on these drawings appears inconsistent with this intent, in the opinion of the Contractor, he shall notify the Designer in writing of his opinion and await instructions from the Designer before proceeding with the work.
4. Where more detailed information is needed, or when an interpretation of the contract documents is required, the Contractor shall refer the matter in writing to the Designer prior to proceeding with the work. The Designer shall furnish the Contractor an interpretation in writing.
5. If the Contractor discovers errors, inconsistencies, discrepancies or omissions in the contract documents, the Contractor shall inform the Designer of such condition prior to proceeding with the work.
6. If the Contractor discovers errors, inconsistencies, discrepancies or omissions in the contract documents prior to bid, the Contractor shall request clarifications from the Designer and shall include in the bid price all work required to deliver a fully operational and ready to use system.
7. If inconsistencies, discrepancies or contradictions in the Contract Documents are discovered after the bid, the Contractor shall be deemed by submittal of his bid, to have bid the most costly as to labor, materials, duration, sequence and method of construction to provide the work.

ARTICLE 3 - CLARIFICATION AND DETAIL DRAWINGS

(PARAGRAPH "a": ADD THE FOLLOWING TO THE END OF THE PARAGRAPH):

- a. If errors, inconsistencies or discrepancies in the contract documents are discovered by the Contractor, the Contractor shall inform the designer of such condition prior to proceeding with the work. The designer shall furnish the Contractor written clarification in a reasonable time, so as not to impact the progress of the work.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLE DATA

(PARAGRAPH "c": ADD THE FOLLOWING):

- c. This schedule must account for any resubmittals required to obtain approval from the Project Designer and Owner.

(PARAGRAPH "d": ADD THE FOLLOWING):

- d. No time extension will be granted for delays caused due to failure of the Contractor to properly review shop drawings prior to submittal to the Project Designer. All shop drawings shall indicate how materials relate to conditions of the project. Standard manufacturer's drawings that do not show how and where material is to be used will not be reviewed by the Project Designer. Shop drawings shall not be reproductions of contract documents. Coordination drawings are required in accordance with Article 14.

ARTICLE 8 - MATERIALS, EQUIPMENT, AND EMPOLYEEES

(ADD PARAGRAPH "f" AS FOLLOWS):

- f. The designer is the judge of equivalency of materials, products, equipment, assemblies, or installation methods proposed by the Contractor as equivalent to those specified,"

(PARAGRAPH "g": ADD THE FOLLOWING TO THE END OF THE PARAGRAPH):

- g. All construction personnel shall be respectful to all University of North Carolina at Wilmington staff and students. Any disrespect, harassment, unwelcome comments or advances from any construction personnel toward any staff member or student shall constitute sufficient grounds for University of North Carolina at Wilmington to request removal of any specific individuals from this project. Such action taken by the Owner shall not constitute grounds for a delay claim. The Owner will not be responsible for any delays caused to the project due to any individual being removed from the project. Project superintendents shall be held accountable for any incident of this nature."

ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS

(ADD PARAGRAPH "f" AS FOLLOWS):

- f. Notify UNCW EH&S a minimum of one day in advance prior to performing work requiring a Hot Work Permit.

ARTICLE 11 - PROTECTION OF WORK, PROPERTY, AND THE PUBLIC

(ADD PARAGRAPHS "j, k and l" AS FOLLOWS):

- j. In case emergency contact is required, the Contractor shall furnish the Owner with names, pager numbers, and telephone numbers (day and night) of the project manager and superintendent. The numbers shall remain current for the duration of the project and shall be updated as required.
- k. The Owner will provide security as it deems prudent and necessary for its own protection. The Contractor shall be responsible for security and safety of the project within the project limits, including on-site materials. The Contractor and the Owner shall meet on a regular basis as required but not less than weekly to coordinate safety and security issues.
- l. The Owner will conduct normal operations during the duration of the project. Unless otherwise stated, the campus buildings will be occupied and will operate on a normal schedule. This means that the Contractor will be required to schedule work around regular operations, special events, visitors and staff requirements. The Contractor shall coordinate with the Owner's representative to minimize any disruptions to the functions of the College.

ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973

(ADD PARAGRAPHS "e, f and g" AS FOLLOWS):

- e. The Contractor shall comply with the following requirements: Equipment utilized during the construction activity on a site must be operated and maintained in a manner as to prevent the potential or actual pollution of the surface or ground waters. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged on the ground or into surface waters. Spent fluids shall be disposed of in a manner so as not to enter the waters, surface or ground, and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the waters, surface or ground, storm sewers, or drains on private or public property.

Herbicide, pesticide, and fertilizer usage during the construction activity shall be restricted to those Materials approved by EPA and shall be used in accordance with label instructions. All wastes composed of construction materials shall be disposed of in accordance with NC General Statutes, Chapter 130A, Article 9- Solid Waste Management, and rules governing the disposal of solid waste (NC Administrative Code Section 15A NCAC 13B).

f. Minimum Monitoring and Reporting Requirements:

1. All sedimentation and erosion control of facilities shall be inspected by the Contractor at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24-hour period.
2. Storm water runoff discharges shall be inspected by visual observation for color, foam, outfall, staining, visible sheens, dry weather flows and muddy water (at the frequency described above) to evaluate the effectiveness of the pollution control facilities or practices. If any visible off-site sedimentation is leaving the site, corrective action shall be taken to reduce the discharge of sediments.
3. The Contractor shall submit to the Owner a written report of weekly inspections. In accordance with NCDEQ requirements and utilizing the self-inspection and monitoring forms. Visible sedimentation found off the site shall be recorded with a brief explanation as to the measures taken to prevent future releases as well as any measures taken to clean up the sediment that has left the site. This record shall be made available to Department of Environmental Management or authorized agent upon request.

g. Maintenance and Inspections: The Contractor shall keep all erosion controls devices and materials in good repair. If inspections required by this permit identify a need for maintenance of control measures, modifications or additions to control measures, or corrective actions to control sediment or other pollutants these actions must be performed as soon as possible and before the next storm event to maintain the effectiveness of the control measures. The Owner reserves the right to deduct the cost of maintenance, modifications, additions or corrective actions from the Contractor's application for payment.

1. The owner's representative may periodically evaluate the project for compliance with these requirements.

ARTICLE 14 - CONSTRUCTION, SUPERVISION, AND SCHEDULE

(REVISE PARAGRAPH "e" TO READ AS FOLLOWS):

- e. In such case, the engineer or land surveyor shall coordinate the project benchmark with known campus benchmarks.

ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

(ADD PARAGRAPH "g" AS FOLLOWS):

- g. E-Verify Compliance: Pursuant to Session Law 2013-418, Contractor shall fully comply with the U.S. Department of Homeland Security employee legal status EVerify requirements for itself and all its subcontractors. Owner requires an affidavit attesting to Contractor's compliance. Violation of the provision, unless timely cured, shall constitute a breach of contract.

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

(ADD PARAGRAPHS "h and i" AS FOLLOWS):

- h. Time: The Contractor shall commence work to be performed under this agreement on a date to be specified in a written order from the designer and shall fully complete all work within 185 consecutive calendar days from and including said date. For each day in excess of the above number of days, the Contractor shall pay to the Owner the sum of \$200.00 per calendar day as liquidated damages reasonably estimated in advance to cover the

losses to be incurred by the Owner by reason of failure of said Contractor to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.

- i. Working Hours: The Contractor shall establish a working hour and date schedule and submit to the Owner's representative for approval. Any deviations from this schedule shall be requested from and approved by the Owner at least five (5) work days in advance.
 - 1. The Contractor shall agree to additional restrictions on working hours and days as may be enforced by the Owner during certain periods of the year such as, but not limited to, the week of final exams and move in for each semester.
 - 2. Working Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday.

ARTICLE 31 - REQUEST FOR PAYMENT

(ADD PARAGRAPH "f" AS FOLLOWS):

- f. Contractor shall submit to the Designer a request for payment on AIA Document G702 unless otherwise approved by the Designer.

ARTICLE 38 - USE OF PREMISES

(ADD PARAGRAPHS "e, f, g, h, i and j" AS FOLLOWS):

- e. Storage of construction materials shall be limited to the staging area, as defined in the contract documents.
- f. Where equipment must cross walks, landscaping areas, or ramps, the Contractor shall provide 3/4" plywood sheets for protection of these areas. Cross walks, landscaping areas, or ramps damaged by construction activity shall be repaired or replaced.
- g. The construction site and staging areas as well as Owner's adjacent campus areas shall be kept free of trash, litter, and debris at all times.
- h. Grass in the construction site shall be mowed as often as required to maintain a neat appearance. Tree protection shall extend at least to the drip line of the trees to be protected. Unless otherwise shown on the drawings, minimum tree protection shall include four-foot landscaping fencing supported with steel stakes four foot on center. All areas under the drip line of trees are off limits to vehicular traffic unless protected by plywood.
- i. Landscape protection when required, shall be installed prior to the initial grading stage. No storage of any kind, access, or activity of any kind will be permitted inside the landscaping protection areas.
- j. When required by the drawings, a construction fence shall be installed. The fence shall be construction of heavy-duty chain link material, with screening fabric or privacy slats , and have a minimum height of six feet and it shall have a continuous top tubular rail. Swing gates shall be included at all and every access to the enclosed area.

ARTICLE 39 - CUTTING AND PATCHING

(ADD PARAGRAPH "d" AS FOLLOWS):

- d. All cutting, and patching required to perform the work, and to install the specified products under a particular contract shall be performed under that particular contract. All patching work shall be made by craftsmen skilled in the required work on who may already be engaged on the project. All painting within previously painted areas shall be painted by the contract which caused the need for this painting, unless new finishes have been scheduled. All painting shall be by skilled painters who may already be engaged on the project.

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

(REVISE PARAGRAPH "a" TO READ AS FOLLOWS):

- a. The contractor 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. The University owns the water, sewer, gas, telephone and electrical utilities on campus. The contractor shall arrange for and provide all appurtenances necessary for the provision of temporary services, including connections to existing utilities. Temporary telephone service shall be obtained and paid for by the contractor through the University's telecommunications department. Connections for all other utilities shall be performed under the supervision of Physical Plant personnel. In all cases, the contractor shall give a minimum of 72 hours' notice for the connection of all utilities. The Contractor shall provide temporary electric, gas and water meters on University-owned utility services to the building. The University will read the meters on a monthly basis and will pay for the cost of consumption for these utilities. The University reserves the right to back charge the contractor if the University finds negligence in the use of utilities. Charges for telephone and data utilities will be charged to the contractor directly by UNCW Telecommunications Department on a monthly basis. Contractor is advised to confirm current telephone and data rates with UNCW Telecommunications Department (910 962-4019).

(PARAGRAPH "j": ADD THE FOLLOWING):

- j. General Contractor shall provide his own office facility including telephone and facsimile machines required at location on site approved by the Architect and Owner. The Office shall be weather-tight with lighting, electrical outlets, heating, cooling equipment and equipped with sturdy furniture, drawing rack and drawing display table. The office shall also include a desk and telephone/data outlet. General Contractor's office shall be large enough for his own use and for use as a coordination office to include meeting space with table and chairs for 16 people. Portable toilets must be provided on site. The Owner's toilet facilities shall not be used at any time during the project.

(ADD PARAGRAPH "m" AS FOLLOWS):

- m. It is imperative that Owner's utilities and other services be maintained at all times except for scheduled interruptions. Any necessary utility interruptions shall be approved by the Owner's Representative at least three weeks in advance. If necessary, work shall be performed at night, over the weekend, or during holidays. No extra payment will be made for such work. When utility services cannot be interrupted for the length of time required, the Contractor shall make provisions for temporary services. Pedestrian traffic around the construction limits must be maintained in a clean and safe condition at all times."

ARTICLE 42 - GUARANTEE

(ADD PARAGRAPH "e" AS FOLLOWS):

- e. All warranty periods to be begin at "Final Acceptance" date rather than at the "Substantial Completion" date.

ARTICLE 45 - TAXES

(PARAGRAPH "e": ADD THE FOLLOWING):

- e. Contractors shall submit monthly with their request for payment, a signed statement containing the amount of sales and use tax paid by the Contractor for that particular billing period on the documents included in the project specifications."

END OF SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
AND SUPPLEMENTARY GENERAL CONDITIONS

FORM OF PROPOSAL

CIS Building Improvements
The University of North Carolina at Wilmington
SCO-ID # 19-21380-01A

Contract: _____
Bidder: _____
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 University of North Carolina at Wilmington 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 CIS Building Improvements in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of The State of North Carolina, The University of North Carolina at Wilmington, and LS3P 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:

_____ Lic _____

Plumbing Subcontractor:

_____ Lic _____

Mechanical Subcontractor:

_____ Lic _____

Electrical Subcontractor:

_____ 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.

ALLOWANCES

The undersigned Bidder acknowledges that Allowances, as specified in Section 012100 and modifying addenda, are included in their General Construction Work Base Bid.

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" the base bid.

If Sub-Contractor for Alternate Bid is different from Sub-Contractor indicated for Base Bid, General Contractor shall include name of the Sub-Contractor and the Alternate affected in the space provided below.

Sub-Contractor Name _____ Alternate # _____

Sub-Contractor Name _____ Alternate # _____

Sub-Contractor Name _____ Alternate # _____

Alternate No. 1 (Wood Cap and Wood Handrail)

(Add) _____ Dollars(\$)

Alternate No. 2 (New Glass Rail)

(Add) _____ Dollars(\$)

Alternate No. 3 (Pass-Through, Cubbies and Lighting Under Stairs)

(Add) _____ Dollars(\$)

Alternate No. 4 (Interior Storefront, Ceiling and Electrical Under Stairs)

(Add) _____ Dollars(\$)

Alternate No. 5 (Stretch-Fabric Wall System)

(Add) _____ Dollars(\$)

Alternate No. 6A (Locks and Latches: Schlage L9000 series)

(Add) _____ Dollars(\$)

Alternate No. 6B (Cylinders/Cores: Schlage Everest 7-pin Small Format Interchangeable Core)

(Add) _____ Dollars(\$)

Alternate No. 6C (Panic Hardware: Von Duprin 98 Series)

(Add) _____ Dollars(\$)

Alternate No. 6D (Keyed Removable Mullions: Von Duprin KR4954/9954 Series)

(Add) _____ Dollars(\$)

Alternate No. 6E (Closers: LCN 4011/4111 Series)

(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. 1A	<u>Interior Recess Access Door, 24 by 24-inches</u>	<u>EA</u>	Unit Price (\$) <u> </u>
No. 1B	<u>Exterior Flush Access Door, 24 by 24-inches</u>	<u>EA</u>	Unit Price (\$) <u> </u>
No. 2	<u>Unsuitable Soil Removal (Mechanical Excavation)</u>	<u>CY</u>	Unit Price (\$) <u> </u>
No. 3	<u>Off-Site Unsuitable Soil Disposal</u>	<u>CY</u>	Unit Price (\$) <u> </u>
No. 4	<u>Place and Compact Off-Site Engineered Fill</u>	<u>CY</u>	Unit Price (\$) <u> </u>
No. 5	<u>Place and Compact #57 Stone</u>	<u>CY</u>	Unit Price (\$) <u> </u>

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:

By: _____

Signature

(Proprietorship or Partnership)

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: _____

(CORPORATE SEAL)

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 _____

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.

Identification of HUB Certified/ Minority Business Participation

I, _____
(Name of Bidder)

do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #

Work Type

*Minority
Category

**HUB
Certified
(Y/N)

[illegible]

*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.**

The total value of minority business contracting will be (\$)_____.

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.

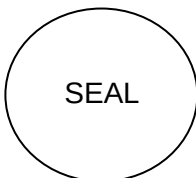
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure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

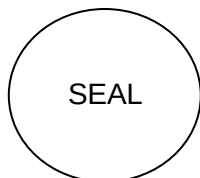
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

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 Name)
Project ID# _____ 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

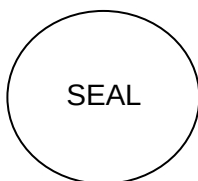
*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** 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.

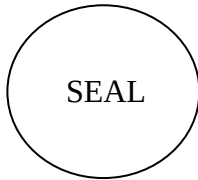
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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 _____

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

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	* TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	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)

Approved/Certified By:

Name

Title

Date

Signature

SUBMIT WITH EACH PAY REQUEST - FINAL PAYMENT - FINAL REPORT

DOCUMENT 003132 - GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 DOCUMENT INCLUDES

- A. Information that is made available to Bidders is for reference only, and is not intended to be part of the Contract.
 - 1. Geotechnical Engineering Report

1.2 USE OF INFORMATION PROVIDED

- A. Bidders are encouraged to review available Project information prior to submitting a Bid, and to obtain additional information if Bidder desires.
- B. Owner-furnished information is provided only for information and convenience to Bidders. The Owner, Architect, or Architect's consultants do not warrant accuracy, adequacy, or applicability of information contained in available Project information. Owner and Architect disclaim responsibility for accuracy of information that has been prepared by others. Owner and Architect further disclaim responsibility for interpretation of that information by Bidders. The information and recommendations in available Project information are the sole responsibility of the preparer.

1.3 GEOTECHNICAL DATA

- A. This Document with its referenced attachment is part of the Procurement and Contracting Requirements for Project. They provide information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' other investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions.
 - 1. This Document and its attachment are for information only and are not part of the Contract Documents.
 - 2. Immediately on discovery of a difference between the Geotechnical Data and the Contract Documents, prepare and submit a detailed report to the Architect and Owner.
- B. A geotechnical engineering report for Project, prepared by ECS Southeast, dated January 29, 2020, is attached to this Document.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 003132

Attachments: Geotechnical Engineering Report



ECS Southeast, LLP

Geotechnical Engineering Report

UNCW – CIS Terrace Project

Wilmington, New Hanover County, North Carolina

ECS Project Number # 22:28700

January 29, 2020





ECS SOUTHEAST, LLP

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January 29, 2020

Mr. David Singley
UNCW Office of Facilities
5150 Lionfish Drive
Room 155
Wilmington, North Carolina 28403

ECS Project No. 22:28700

Reference: Geotechnical Engineering Report
UNCW – CIS Terrace Project
Wilmington, New Hanover County, North Carolina

Dear Mr. Singley:

ECS Southeast, LLP (ECS) has completed the subsurface exploration, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 22:23699, dated November 21, 2019. This report presents our understanding of the geotechnical aspects of the project along, the results of the field exploration conducted, and our design and construction.

It has been our pleasure to be of service to UNCW Office of Facilities during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

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- Reference Notes for Sounding Logs
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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The geotechnical exploration performed for the site included two (2) electronic cone penetration test (CPT) soundings drilled to termination depths of approximately 25 to 50 feet.
- The soundings generally encountered coastal plain soils consisting of very loose to very dense, Silty and Clean SAND (SM, SP) with layers of firm to stiff, Sandy and Clayey SILT (ML) and Lean CLAYS (CL).
- The proposed structures at the site can be supported by conventional shallow foundations consisting of column or strip footings bearing on firm natural soil and/or approved structural fill. We recommend a maximum net allowable bearing pressure of 3,000 psf be used for design. Details of the assumed foundation subgrade elevations and loads are contained in the body of the report.
- Groundwater was indicated in the soundings at depths ranging from about 2.7 to 3.2 feet below existing grades.

Please note this Executive Summary is an important part of this report and should be considered a **“summary”** only. The subsequent sections of this report constitute our findings, conclusions, and recommendations in their entirety.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical information for the preliminary design of the proposed a two-story terrace addition located at the CIS Building off Price Drive in Wilmington, New Hanover County, North Carolina.

The recommendations developed for this report are based on project information supplied by Mr. David Singley of UNCW Office of Facilities. This report contains the results of our subsurface explorations, site characterization, engineering analyses, and recommendations for the design and construction of the proposed development.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of the proposed project, two (2) (CPT) soundings were performed. The soundings were advanced to termination depths of approximately 25 to 50 feet beneath the ground surface.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following.

- A brief review and description of our field test procedures and the results of testing conducted;
- A review of surface topographical features and site conditions;
- A review of area and site geologic conditions;
- A review of subsurface soil stratigraphy with pertinent available physical properties;
- Preliminary foundation recommendations;
 - Allowable bearing pressure;
 - Settlement estimates (total and differential);
- Site development recommendations;
- Suitability of soils for use as fill material;
- Seismic site class and liquefaction recommendations;
- Discussion of groundwater impact;
- Compaction recommendations;
- Special conditions encountered;
- Site vicinity map;
- Exploration location plan; and
- CPT sounding logs.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 22:23699, dated November 21, 2019, as authorized by Mr. David Singley of UNCW Office of Facilities on December 18, 2019, and include the Terms and Conditions of Service outlined with our Proposal.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The proposed site is located at the existing CIS Building off Price Drive in Wilmington, New Hanover County, North Carolina. The site is currently bounded on the south by Price Drive and on all other sides by University buildings and grounds. Figure 2.1.1 below shows an image of where the site is located.



Figure 2.1.1 Site Location

2.2 CURRENT SITE CONDITIONS

Based on our site visit, the site currently consists of an existing building with sidewalks and a patio. Based on our site visit and approximate elevations taken from Google Earth, the site is relatively level, with typical site elevations on site ranging from around 32 to 35 feet.

2.3 PROPOSED CONSTRUCTION

ECS understands the project consists of construction of a two-story terrace addition to the CIS building. Additional information was not provided at the time of this report.

2.3.1 Structural Information/Loads

At the time of this report, additional project information including structural loads and grading information was not available. The following information explains the provided our assumed anticipated structural loads for the purpose of the recommendations made in this report:

Table 2.3.2.1 Structural Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Usage	Institutional
Finished Floor Elevation	Within +/- 3 feet of existing grades
Column Loads	Up to 250 kips
Wall Loads	Up to 8 kips/ft.

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field data to assist in the determination of geotechnical recommendations.

3.1.1 Cone Penetrometer Soundings

The subsurface conditions were explored by drilling two (2) electronic cone penetration test (CPT) soundings on the proposed site. The soundings were advanced to termination depths of approximately 25 to 50 feet.

Sounding locations were located in the field by an ECS representative using a hand held GPS unit and referencing existing site features. The approximate as-drilled sounding location is shown on the Exploration Location Diagram in Appendix A.

The CPT soundings were conducted in general accordance with ASTM D 5778. The cone used in the soundings has a tip area of 10 cm² and a sleeve area of 150 cm². The CPT soundings recorded tip resistance and sleeve friction measurements to assist in determining pertinent index and engineering properties of the site soils. The ratio of the sleeve friction to tip resistance is then used to aid in assessing the soil types through which the tip is advanced. The results of the CPT soundings are presented in Appendix B.

Within sounding S-2, seismic tests were performed at approximately three foot intervals to termination depth to measure the shear wave velocity (v_s) of the subsurface materials to aid in assessing the dynamic response properties of the site subsurface materials. The seismic shear waves are generated by making impact with a 20-pound sledgehammer onto a steel beam. The impacts are initiated on the right and left sides of the CPT rig and the corresponding wave traces recorded on an oscilloscope are analyzed to determine the shear wave velocity of the tested material. The waves are measured with three geophones that are installed in the cone. The results of the CPT soundings are presented in Appendix B.

3.2 REGIONAL/SITE GEOLOGY

The site is located in the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain is composed of seven terraces, each representing a former level of the Atlantic Ocean. Soils in this area generally consist of sedimentary materials transported from other areas by the ocean or rivers. These deposits vary in thickness from a thin veneer along the western edge of the region to more than 10,000 feet near the coast. The sedimentary deposits of the Coastal Plain rest upon consolidated rocks similar to those underlying the Piedmont and Mountain Physiographic Provinces. In general, shallow unconfined groundwater movement within the overlying soils is largely controlled by topographic gradients. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation.

Based on the U.S. Geological Survey^{1,2}, the site of the proposed construction is underlain by the Castle Hayne Formation (Tec). Soils in the Castle Hayne Formation typically consist of bluish-gray to tan, loosely consolidate fossiliferous sands with silts and clays underlain by limestone. The coastal plain soils generally consist of silty and clean sands, silts, and silty, sandy lean, and lean clays. An overview of the general site geology is illustrated in Figure 3.2.1 below.

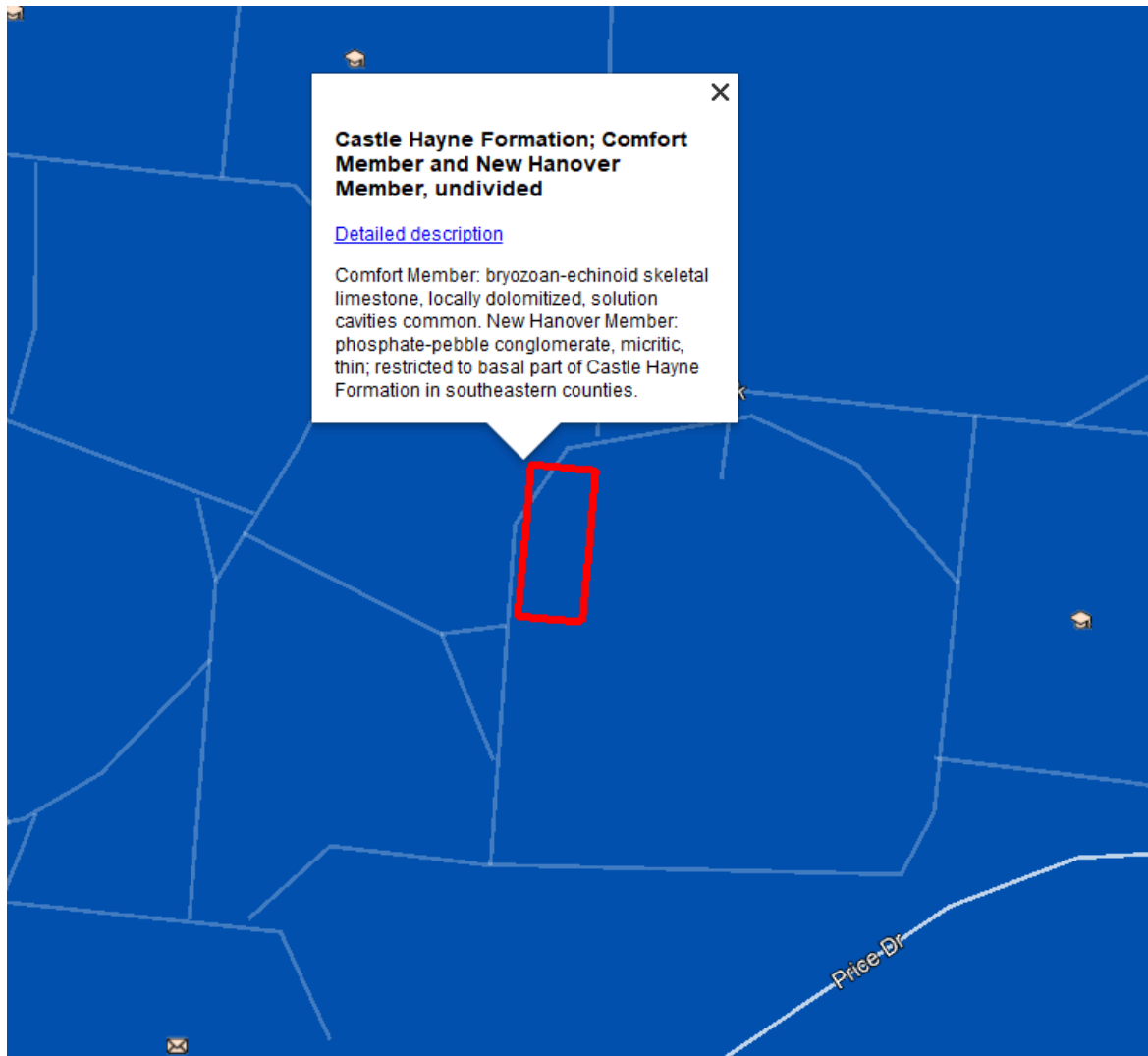


Figure 3.2.1

Geologic map for Figure 3.2.1 obtained from The North Carolina Dept. of Environment, Health, and Natural Resources, Division of Land Resources, NC Geological Survey, in cooperation with the NC Center for Geographic Information and Analysis, 1998, Geology - North Carolina (1:250,000), coverage data file geol250 and Google Earth.

¹ Rhodes, Thomas S., and Conrad, Stephen G., 1985, Geologic Map of North Carolina: Department of Natural Resources and Community Development, Division of Land Resources, and the NC Geological Survey, compiled by Brown, Philip M., et al, and Parker, John M. III, and in association with the State Geologic Map Advisory Committee, scale 1:500,000.

² The North Carolina Dept. of Environment, Health, and Natural Resources, Division of Land Resources, NC Geological Survey, in cooperation with the NC Center for Geographic Information and Analysis, 1998 (updated 2007), Geology - North Carolina (1:250,000), coverage data file geol250. The data represents the digital equivalent of the official State Geology map (1:500,000 scale), but was digitized from (1:250,000 scale) base maps.

3.3 Subsurface Characterization

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil encountered during our subsurface exploration. For subsurface information at a specific location, refer to the CPT Sounding Logs in Appendix B.

Table 3.3.1 Subsurface Stratigraphy

Approximate Depth Range	Stratum	Description	Ranges of N*-Values(1) blows per foot (bpf)
0 to 25	I	Very Loose to very dense, Silty and Clean SAND (SM, SP).	2 to 57
25 to 50	II	Medium dense to dense, Silty and Clean SAND (SM, SP) with layers of firm to stiff Sandy and Clayey Silt (ML) and Lean Clay (CL)	13 to 39

Notes: (1) Equivalent Corrected Standard Penetration Test Resistances

3.4 GROUNDWATER OBSERVATIONS

Porewater pressure measurements were made at the sounding locations during exploration as noted on the CPT sounding logs in Appendix B. The apparent groundwater depths were observed at the time of drilling and during field exploration to have approximately ranged from 2.7 to 3.2 feet below ground surface in the soundings and borings.

The highest groundwater observations are normally encountered in the late winter and early spring. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors not immediately apparent at the time of this exploration. If long term water levels are crucial to the development of this site, it would be prudent to verify water levels with the use of perforated pipes or piezometers.

4.0 DESIGN RECOMMENDATIONS

4.1 BUILDING DESIGN

The following sections provide recommendations for foundation design, soil supported slabs, and seismic site classification.

4.1.1 Foundations

Provided subgrades and structural fills are prepared as discussed herein and anticipated structural loads provided in Table 2.3.2.1 are not exceeded, the proposed structures can be supported by conventional shallow foundations: individual column footings and continuous wall footings. The design of the foundation shall utilize the following parameters:

Table 4.1.1.1 Foundation Design

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure ¹	3,000 psf	3,000 psf
Acceptable Bearing Soil Material	Stratum I Soils (SANDS) or Approved Structural Fill	Stratum I Soils (SANDS) or Approved Structural Fill
Minimum Width	30 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade)	12 inches	12 inches
Estimated Total Settlement	1 inch	1 inch
Estimated Differential Settlement	Less than 0.5 inches	Less than 0.5 inches

1. Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete; to confirm the bearing soils are what was anticipated. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. The undercut areas should be backfilled with approved structural fill up to the original design bottom of footing elevation; the original footing shall be constructed on top of the structural fill. The depth and lateral extent of the undercut should be determined in the field during undercutting operation. An ECS representative must be on site during the undercut and backfill of the areas in order to provide a report stating that the repairs were in accordance with our recommendations.

4.1.2 Floor Slabs

The on-site soils are generally considered suitable for support of the floor slabs. Moisture control during earthwork operations, including the use of discing or appropriate drying equipment, may be necessary. Assuming the finished floor elevation is around the current site elevations, it appears that the slabs for the structure will likely bear on the near surface Stratum I soils or Approved Structural Fill. These materials are suitable for the support of a slab-on-grade, however, there may be areas of soft or yielding soils that should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. The following graphic depicts our soil-supported slab recommendations:

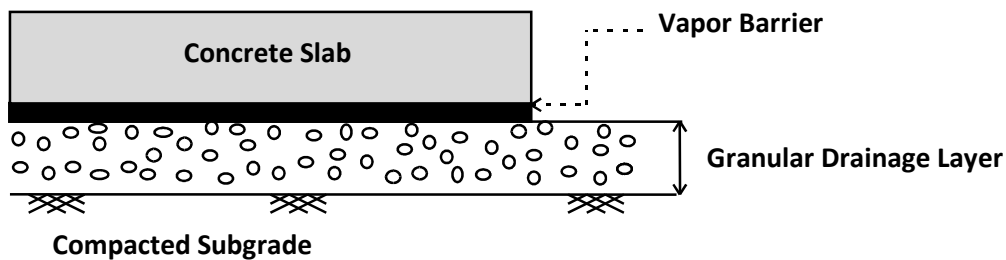


Figure 4.1.2.1

1. Drainage Layer Thickness: 6 inches
2. Drainage Layer Material: GRAVEL (GP, GW), SAND containing <20% fines (SP, SW, SM)
3. Subgrade compacted to 98% maximum dry density per ASTM D698

Subgrade Modulus: Provided the placement of structural fill and granular drainage layer per the recommendations discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k of 150 pci (lbs/cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

Slab Isolation: Ground-supported slabs should be isolated from the foundations and foundation-supported elements of the structures so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration (turn down slabs or post tension mats) prevents the use of a free-floating slab, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab. Maximum differential settlement of soils supporting interior slabs is anticipated to be less than 0.5 inches in 50 feet.

4.1.3 Seismic Design Considerations

Liquefaction: When a saturated soil with little to no cohesion liquefies during a major earthquake, it experiences a temporary loss of shear strength as a result of a transient rise in excess pore water pressure generated by strong ground motion. Flow failure, lateral spreading, differential settlement, loss of bearing, ground fissures, and sand boils are evidence of excess pore pressure generation and liquefaction.

The potential for liquefaction at the site is considered low based upon the CPT results and the liquefaction index procedure developed by Iwasaki (1982). Based on our CPT results and our evaluation using a site peak ground acceleration of 0.17 (PGA_m), an earthquake event with a magnitude of 7.3 and procedures developed by Robertson (2009) and Boulanger & Idriss (2014), the liquefaction induced settlement at the subject site is estimated to be approximately 2 inches or less.

Seismic Site Classification: The International Building Code (IBC) 2015 requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The first method (shear wave velocity) was used in classifying this site.

The seismic Site Class for the site was determined by calculating a weighted average of the shear velocities of the overburden to the depth of rock/refusal. The CPT test data indicates that the existing natural, overburden soils at the site have shear velocities ranging from approximately 489 ft/sec to 1,746 ft/sec. The method for determining the weighted average value is presented in Section 1613.5.5 of the IBC 2015. The weighted average value for the site is 1,072 ft/sec. Based on the results of the CPT soundings, it is our interpretation the site may be considered a Site Class D.

The results of the shear wave velocity profiles are contained in Appendix B. The seismic site class definitions for the weighted average of shear wave velocity or SPT N-value in the upper 100 feet of the soil profile are shown in the following table:

Table 4.1.3.1: Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, V_s , (ft./s)	N value (bpf)
A	Hard Rock	$V_s > 5,000$ fps	N/A
B	Rock	$2,500 < V_s \leq 5,000$ fps	N/A
C	Very dense soil and soft rock	$1,200 < V_s \leq 2,500$ fps	>50
D	Stiff Soil Profile	$600 \leq V_s \leq 1,200$ fps	15 to 60
E	Soft Soil Profile	$V_s < 600$ fps	<15

Ground Motion Parameters: In addition to the seismic site classification noted above, ECS has determined the design spectral response acceleration parameters for a seismic site class “D” following the IBC 2015 methodology. The mapped responses were estimated from the free ATC Hazards by Location Tool available from the USGS website (<https://hazards.atcouncil.org>). The design responses for the short (0.2 sec, $S_{0.2}$) and 1-second period (S_{D1}) are noted at the far right end of the following table.

Table 4.1.3.2: Ground Motion Parameters (IBC 2015) Site Class D

Period (sec)	Mapped Spectral Response Accelerations (g)		Values of Site Coefficient for Site Class		Maximum Spectral Response Acceleration Adjusted for Site Class (g)		Design Spectral Response Acceleration (g)	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_s	0.213	F_a	1.6	$S_{MS}=F_a S_s$	0.341	$S_{DS}=2/3 S_{MS}$	0.227
1.0	S_1	0.090	F_v	2.4	$S_{M1}=F_v S_1$	0.217	$S_{D1}=2/3 S_{M1}$	0.144

The Site Class definition should not be confused with the Seismic Design Category designation, which the structural engineer typically assesses.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping vegetation, rootmat, topsoil, existing fill, foundations, and utilities, and any other soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits. The soundings on the site encountered minimal amounts of topsoil. ECS should be called to verify that topsoil, roots, and unsuitable surficial materials have been removed prior to the placement of structural fill or construction of structures.

5.1.2 Proofrolling

After removing unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be examined by the geotechnical engineer or authorized representative. The exposed subgrade should be proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the geotechnical engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials. In the event that unstable or “pumping” subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning, should be discussed with the geotechnical engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. A test pit(s) may be excavated to explore the shallow subsurface materials in the area of the instability to help in determining the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade.

5.2 EARTHWORK OPERATIONS

5.2.1 Structural Fill Materials

Product Submittals: Prior to placement of structural fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Materials satisfactory for use as structural fill should consist of inorganic soils classified as SM, SC, SW, SP, GW, GP, GM and GC, or a combination of these group symbols, per ASTM D 2487. Natural fine-grained soils classified as clays or silts (CL, ML) should not be considered for use as engineered fill, but may be evaluated by the geotechnical engineer to determine their suitability at the contractor's request. The materials should be free of organic matter, debris, and should contain no particle sizes greater than 4 inches in the largest dimension. Open graded materials, such as gravels (GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Suitable structural fill material should have the index properties shown in Table 5.2.1.1.

Table 5.2.1.1 Structural Fill Index Properties

Location with Respect to Final Grade	Liquid Limit	Plasticity Index
Building Areas, upper 4 feet	35 max	9 max
Pavement Areas, upper 2 feet	35 max	9 max

Unsatisfactory Materials: Materials that should not be used as engineered fill include topsoil, organic materials (OH, OL), and high plasticity clays and silts (CH, MH). Such materials removed during grading operations should be either stockpiled for later use in landscape fills, or placed in approved on or off-site disposal areas.

On-Site Borrow Suitability: The on-site sands (SP, SM) in the upper 6 feet that are free of roots and deleterious materials should be suitable for re-use as structural fill. However, moisture conditioning should be anticipated for the soils to achieve the optimum moisture content for fill placement.

5.2.2 Compaction

Structural Fill Compaction: Structural fill within the expanded building and pavement limits should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -3 and +3 % of the soil's optimum moisture content, and be compacted with suitable equipment to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called to document that proper fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for buildings, pavements, and slopes, etc., at the time of fill placement. Grade controls should be maintained throughout the filling operations. Filling operations should be observed on a full-time basis by a qualified representative of the geotechnical engineer or construction testing laboratory to determine that the minimum compaction requirements are being achieved. Field density testing of fills should be performed at the frequencies shown in Table 5.2.2.1, but not less than one test per lift.

Table 5.2.2.1 Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft. per lift
Pavement Areas	1 test per 5,000 sq. ft. per lift
Utility Trenches	1 test per 200 linear ft. per lift
Other Non-Critical Areas	1 test per 10,000 sq. ft. per lift

Compaction Equipment: Compaction equipment suitable to the soil type being compacted should be used to compact the subgrades and fill materials. A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands and Gravels) as well as for sealing compacted surfaces.

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to placement of structural fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each work day, fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade subgrade soils.

Fill material should be placed in horizontal lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 3 inches to 4 inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

5.3 FOUNDATION OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick “mud mat” of “lean” concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated. Soft or unsuitable soils observed at the footing bearing elevations should be undercut and removed. Any undercut should be backfilled with approved structural fill or DOT size No. 57 stone up to the original design bottom of footing elevation; the original footing shall be constructed on top of the approved fill. The depth and lateral extent of the undercut should be determined in the field during undercutting operation. An ECS representative must be on site during the undercut and backfill of the areas in order to provide a report stating that the repairs were in accordance with our recommendations.

Slab Subgrade Verification: A representative of ECS should be called to observe exposed subgrades within the expanded building limits prior to structural fill placement to confirm that adequate subgrade preparation has been achieved. Proofrolling using a drum roller or loaded dump truck should be performed in their presence at that time. Once subgrades have been prepared to the satisfaction of ECS, subgrades should be properly compacted and new structural fill can be placed.

Structural fill should be moisture conditioned to within -3/+3 percentage points of optimum moisture content then be compacted to the required density. If there will be a significant time lag between the site grading work and final grading of concrete slab areas prior to the placement of the subbase stone and concrete, a representative of ECS should be called to verify the condition of the prepared subgrade. Prior to final slab construction, the subgrade may require scarification, moisture conditioning, and re-compaction to restore stable conditions.

5.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrade should be observed and probed for stability by ECS to evaluate the suitability of the materials encountered. Any loose or unsuitable materials encountered at the utility pipe subgrade elevation should be removed and replaced with suitable compacted structural fill or pipe bedding material.

Utility Backfilling: Granular bedding material, if required, should be at least 4 inches thick, but not less than that specified by the project drawings and specifications. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for structural fill given in this report. Compacted backfill should be free of topsoil, roots, ice, or any other material designated by ECS as unsuitable. The backfill should be moisture conditioned, placed, and compacted in accordance with the recommendations of this report.

Utility Excavation Dewatering: It is likely that groundwater will be encountered by utility excavations which extend more than 4 feet below existing grades. It is expected that removal of water which seeps into excavations could be accomplished by pumping from sumps excavated in the trench bottom and which are backfilled with DOT size No. 57 stone or open graded bedding material. Should water conditions beyond the capability of sump pumping be encountered, the contractor should submit a Dewatering Plan in accordance with project specifications.

5.5 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by mechanical manipulation in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should comply with applicable OSHA regulations to confirm that adequate protection of the excavations and trench walls is provided. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Excavation Considerations: Based on the results of the borings, we expect that the natural Coastal Plain soils encountered on this site can be excavated with conventional earth moving equipment such as loaders, bulldozers, rubber tired backhoes, etc.

The site soils are OSHA Type C soils for the purpose of temporary excavation support. Excavations should be constructed in compliance with current OSHA standards for excavation and trenching safety. Excavations should be observed by a “competent person,” as defined by OSHA, who should evaluate the specific soil type and other conditions, which may control the excavation side slopes or the need for shoring or bracing. Regardless, site safety shall be the sole responsibility of the contractor and their subcontractors. Exposed earth slopes shall be protected during periods of inclement weather.

Erosion Control: The surface soils may be erodible. Therefore, the contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. Erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

6.0 CLOSING

ECS has prepared this report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

The description of the proposed project is based on information provided to ECS by Mr. David Singley of UNCW Office of Facilities. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately so that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

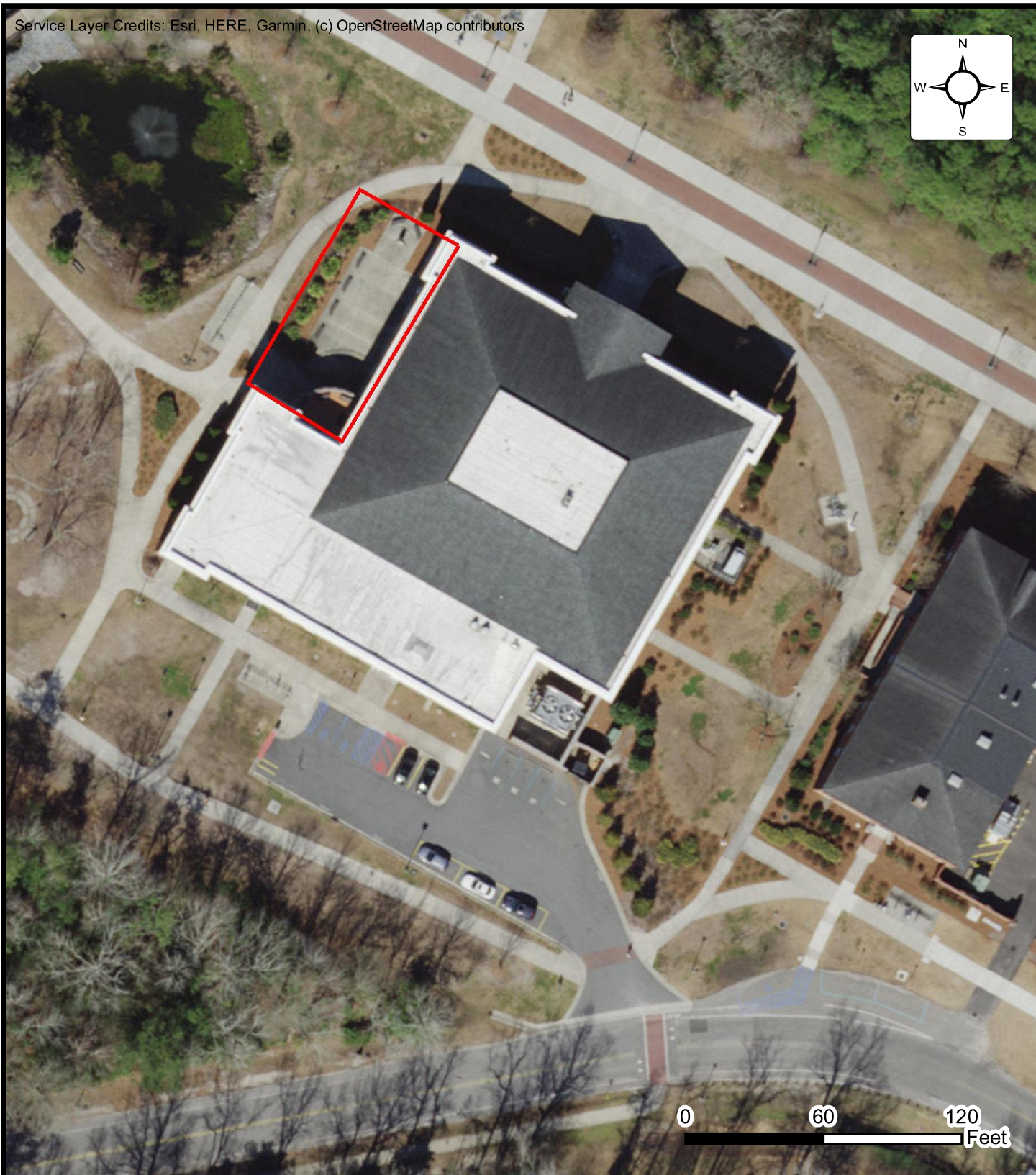
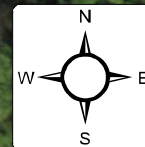
We recommend that ECS review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram

Exploration Location Diagram



Site Location Diagram
UNCW - CIS TERRACE PROJECT
PRICE DRIVE, WILMINGTON, NORTH CAROLINA
UNCW

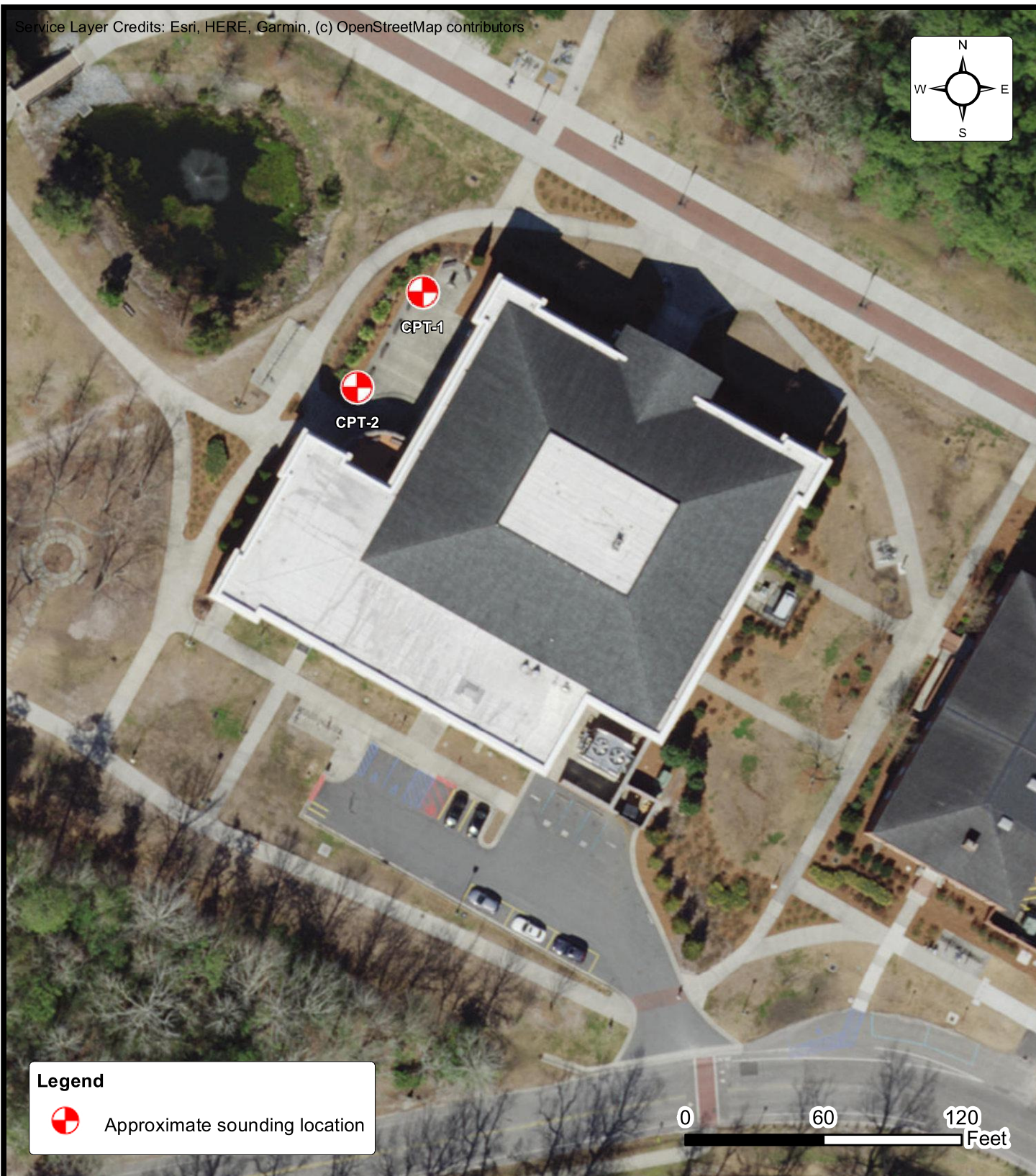
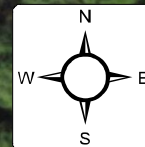
ENGINEER
WEG

SCALE
1" = 60'

PROJECT NO.
22-28700

SHEET
1 OF 2

DATE
1/23/2020



Legend



Approximate sounding location



Boring Location Diagram
UNCW - CIS TERRACE PROJECT
PRICE DRIVE, WILMINGTON, NORTH CAROLINA
UNCW

ENGINEER
WEG

SCALE
1" = 60'

PROJECT NO.
22:28700

SHEET
2 OF 2

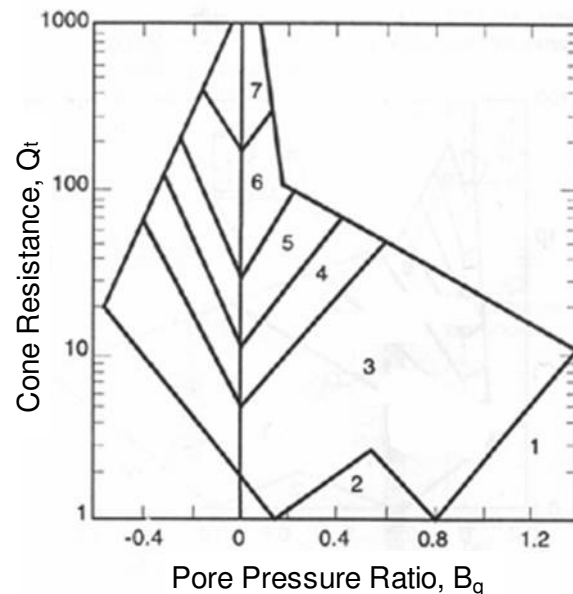
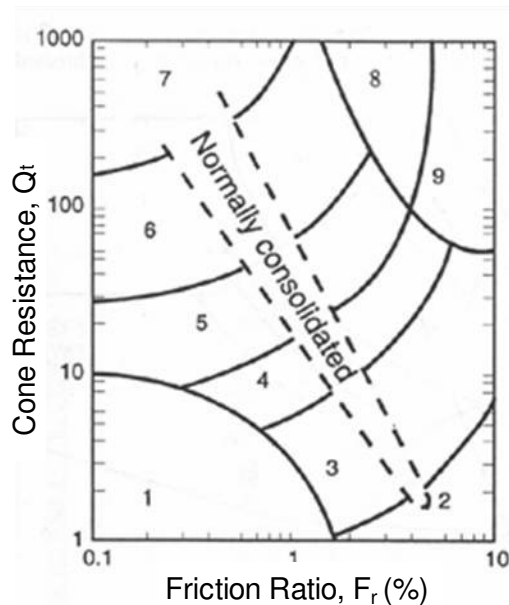
DATE
1/23/2020

APPENDIX B – Field Operations

Reference Notes for Sounding Logs
CPT Sounding Logs (S-1 and S-2)

REFERENCE NOTES FOR CONE PENETRATION TEST (CPT) SOUNDINGS

In the CPT sounding procedure (ASTM-D-5778), an electronically instrumented cone penetrometer is hydraulically advanced through soil to measure point resistance (q_c), pore water pressure (u_2), and sleeve friction (f_s). These values are recorded continuously as the cone is pushed to the desired depth. CPT data is corrected for depth and used to estimate soil classifications and intrinsic soil parameters such as angle of internal friction, preconsolidation pressure, and undrained shear strength. The graphs below represent one of the accepted methods of CPT soil behavior classification (Robertson, 1990).



1. Sensitive, Fine Grained
2. Organic Soils-Peats
3. Clays; Clay to Silty Clay
4. Clayey Silt to Silty Clay
5. Silty Sand to Sandy Silt

6. Clean Sands to Silty Sands
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff Fine Grained

The following table presents a correlation of corrected cone tip resistance (q_c) to soil consistency or relative density:

SAND		SILT/CLAY	
Corrected Cone Tip Resistance (q_c) (tsf)	Relative Density	Corrected Cone Tip Resistance (q_c) (tsf)	Relative Density
<20	Very Loose	<5	Very Soft
20-40	Loose	5-10	Soft
40-120	Medium Dense	10-15	Medium Stiff
120-200	Dense	15-30	Stiff
>200	Very Dense	30-45	Very Stiff
		45-60	Hard
		>60	Very Hard



ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-28700

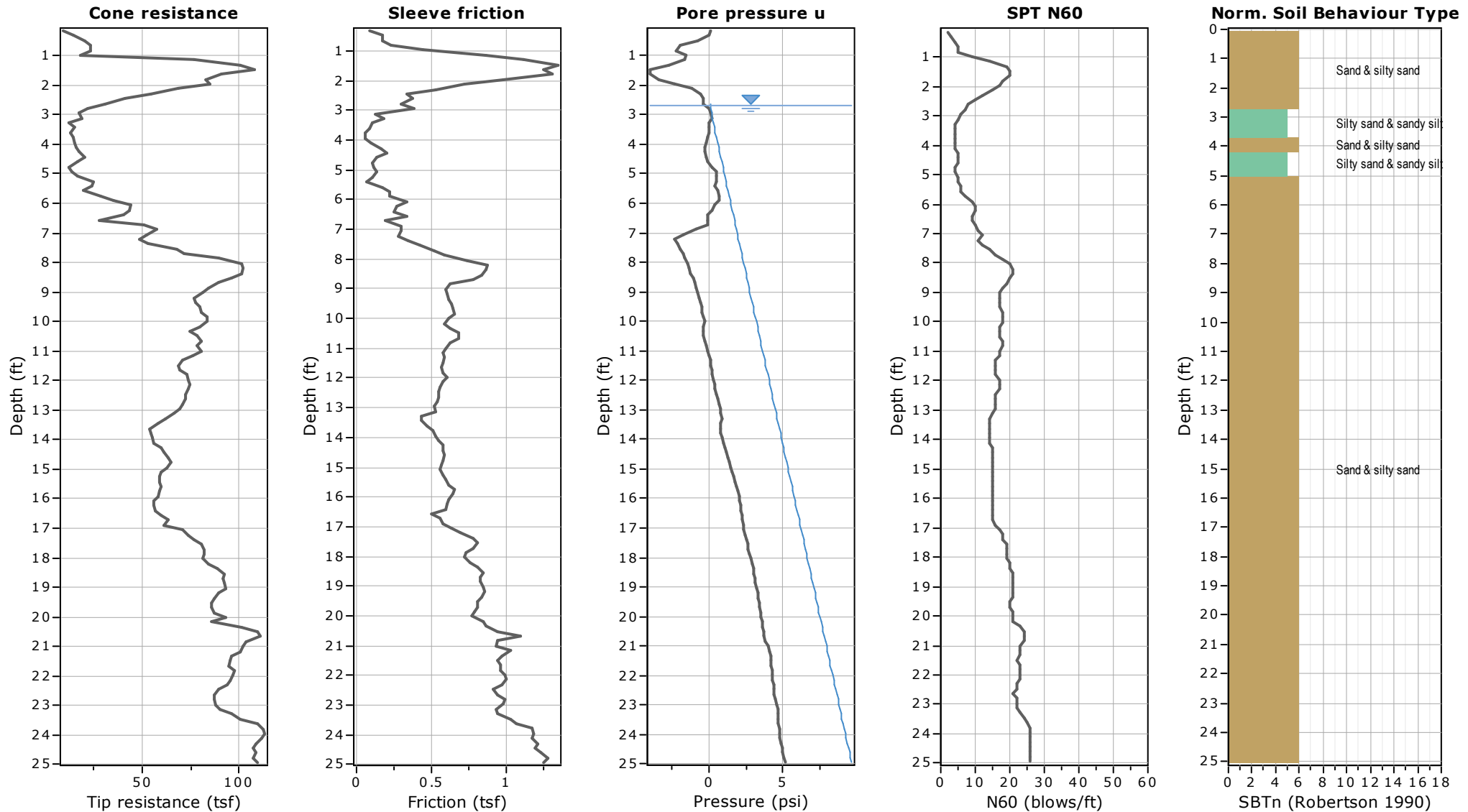
Project: **UNCW - CIS Terrace Project**

Location: **Wilmington, New Hanover County, North Carolina**

CPT: S-1

Total depth: 24.93 ft, Date: 1/18/2020

Cone Operator: Austin Fowler





ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28403
ECS Project # 22-28700

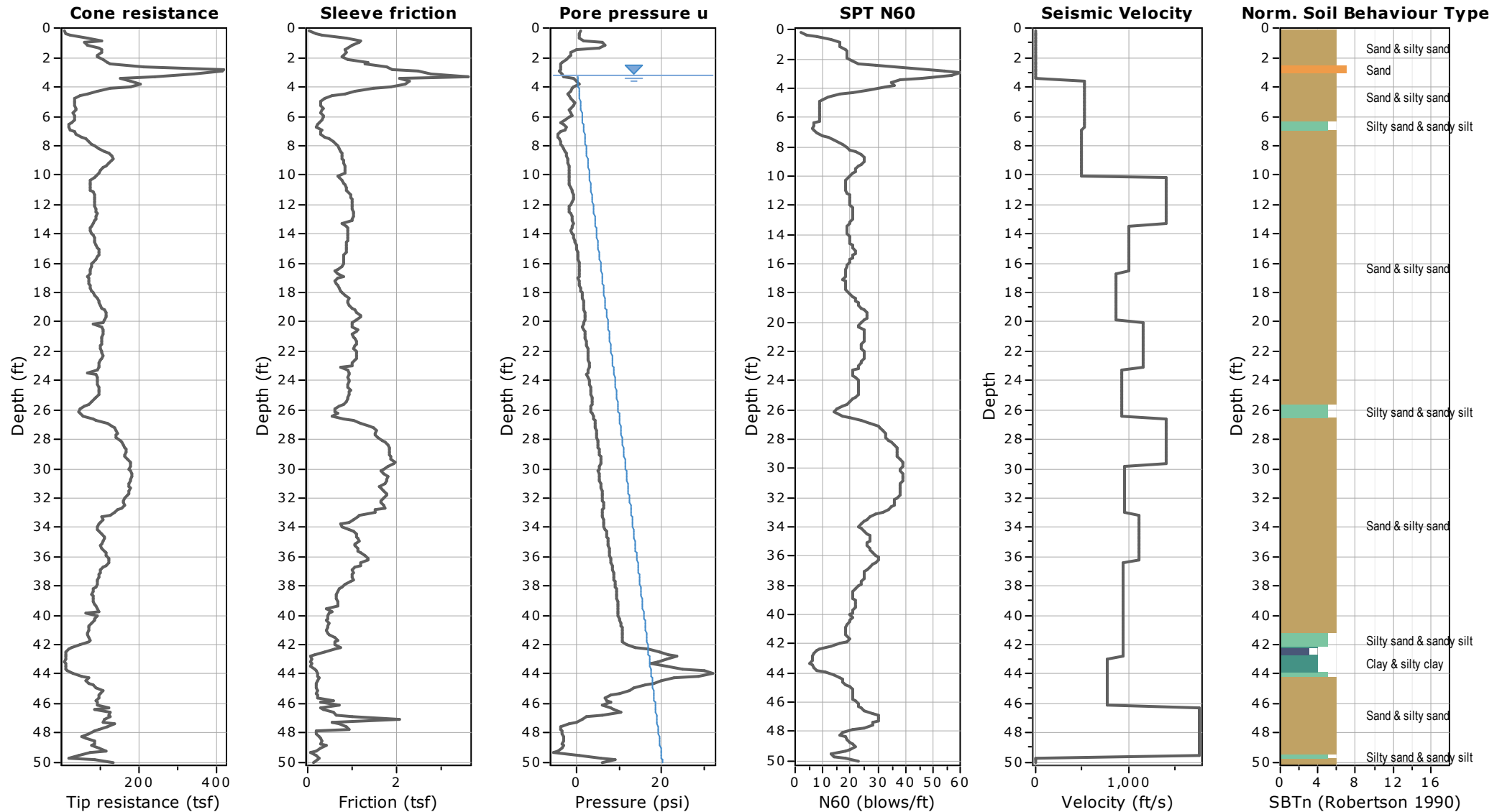
Project: UNCW - CIS Terrace Project

Location: Wilmington, New Hanover County, North Carolina

CPT: S-2

Total depth: 50.03 ft, Date: 1/18/2020

Cone Operator: Austin Fowler



APPENDIX C – Supplemental Report Documents

GBA Document

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

BIDDER'S REQUEST FOR SUBSTITUTION FORM

Requests for Substitution are accepted from prime bidders only. Subcontractors and suppliers must submit requests through a prime bidder. Bidders are required to submit this completed form with required attachments no later than 10 days prior to opening of bids. Comply with requirements of the Instructions to Bidders and Supplementary Instructions to Bidders.

Project: UNCW CIS Building Improvements Project No.: 7202-191372
To: LS3P Specification Section #: _____
Wilmington, NC Prime Bidder: _____
Attn.: Laura Miller, AIA Requested by: _____
Phone: 910-790-9901 Phone: _____
Fax: 910-790-3111 Fax: _____
Email: lauramiller@ls3p.com Email: _____

Specified Product/Fabrication Method

(List name/description; model no.; manufacturer): _____

Required Information for **Specified** Product:

Point by Point Comparative Product Data

Tests

Reports

Fabrication Drawings

Samples (Where Applicable)

Attached:

☐☐☐☐☐**Proposed Product/Fabrication Method**

(List trade name/description; model no.; manufacturer): _____

Required Information for **Proposed** Product:

Point by Point Comparative Product Data

Tests

Reports

Fabrication Drawings

Samples (Where Applicable)

Attached:

☐ (Required)

☐☐☐☐

List of Related Changes/Modifications: _____

Differences between proposed substitution
and specified product: _____

Proposed product/fabrication method
affects other parts of the Work

☐ No ☐ Yes: Explain _____

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.

For the Bidder:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

For the Manufacturer:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

END OF BIDDER'S REQUEST FOR SUBSTITUTION FORM

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under Owner's separate contracts.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and Drawing conventions.

B. Related Requirements:

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

1.2 PROJECT INFORMATION

A. Project Identification: UNCW CIS Building Improvements.

1. Project Location: UNCW, 601 S College Rd, Wilmington, NC 28403.

B. Owner: State of North Carolina through The University of North Carolina at Wilmington.

1. Owner's Representative: David Singley, Project Manager

C. Architect: LS3P Associates Ltd. (LS3P), 101 N. Third Street, Suite 500, Wilmington, North Carolina 28401.

1. Architect's Representative: Laura Miller, AIA

1.3 WORK COVERED BY CONTRACT DOCUMENTS

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

1. Replace existing metal wall panels with wood wall panels.
2. Remove portions of wall beneath stair to create pass-through to space behind and small study room.
3. Remove solid wall at stair and replace with glass rail and wood handrail.
4. Replace metal cap at existing glass rail with wood cap.
5. Install acoustical panels at select vertical surfaces to aid in sound attenuation throughout lobby.
6. Remove existing brick arcade and add two-story terrace.
7. Associated electrical and mechanical work.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A. 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.
- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations may be conducted simultaneously with Work under this Contract.
 - 1. Furnish and install carpeting.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways, and Entrances: Keep driveways loading 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.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner may occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. E-Verify Compliance: Pursuant to Session Law 2013-418, Contractor shall fully comply with the U.S. Department of Homeland Security employee legal status E-Verify requirements for itself and all its subcontractors. Owner requires an affidavit attesting to Contractor's compliance. Violation of the provision, unless timely cured, shall constitute a breach of contract.
- C. Iran Divestment Act Certification: By signing an agreement; accepting a contract/purchase order; or submitting any bid, proposal, etc., vendors and contractors certify that as of the date of execution, receipt, or submission they are not listed on the Final Divestment List created by the NC Office of State Treasurer

pursuant to NCGS 147 Article 6E, Iran Divestment Act, Iran Divestment Act Certification. Vendors and contractors shall not utilize any subcontractor that is identified on the Final Divestment List.

- D. Divestment from Companies Boycotting Israel: Any organization defined under NCGS 147-86.80(2), Divestment from Companies Boycotting Israel, shall not engage in business totaling more than \$1,000 with any company/business, etc. that boycotts Israel. A list of companies that boycott Israel is maintained by the NC Office of State Treasurer, pursuant to NCGS 147-86.81(a)(1). Any company listed as boycotting Israel is not eligible to do business with any State agency or political subdivision of the State.
- E. Lien Agent Information Compliance: Pursuant to North Carolina Law, Contractor shall fully comply with the Lien Agent System requirements for itself and all its subcontractors. Violation of the provision, unless timely cured, shall constitute a breach of contract.
- F. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated.
- G. Pandemic Restrictions:
 - 1. Workers shall wear face masks at all times while in the building.
 - a. Face masks are not required for workers when working outside and socially distancing.
 - 2. Workers shall practice social distancing guidelines as outlined by the CDC, WHO, and NC DHHS.
- H. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- I. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- J. Employee Conduct: Workers shall conduct themselves in a business-like manner at all times.
 - 1. No loud radios will be allowed.
 - 2. No guns or weapons will be allowed.
 - 3. No drugs or alcohol will be allowed.
 - 4. No harassment of any kind, including catcalls, foul language or other offensive language, gestures or other objectionable behavior, directed to the Owner's staff, students, the public, or other workers on the site will be permitted.
 - 5. All employees must wear proper attire at all times. Shirts and shoes are required. T-shirts are acceptable provided they contain no objectionable graphics or text, as determined by the Owner.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

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

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

STATE OF _____

E-VERIFY AFFIDAVIT

COUNTY OF _____

I, _____ (the individual attesting below), being duly authorized by and on behalf of _____ (the entity bidding on project hereinafter "Employer")

after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS§64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State. (Mark "Yes" or "No")

a. YES _____

b. NO _____

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This _____ day of _____, 20____.

Signature of Affiant

Print or Type Name: _____

State of _____ County of _____

Signed and sworn to (or affirmed) before me, this the _____

day of _____, 20____.

My Commission Expires:

Notary Public

(Affix Official/Notarial
Seal)

Lien Agent Information

What is the lien agent system? The State of NC signed into law the lien agent system April 1, 2013. It was enacted to address the so called 'hidden lien' problem associated with construction projects. Existing mechanics's lien law had no mechanism for contractors, subcontractors or suppliers to publish their participation in a project. Consequently, purchasers, lenders and closing attorneys would be unable to determine who had worked on a construction project and deserved to be paid - often until long after closing.

The mechanics's lien agent system allows (but does not require) potential lien claimants to give notice they are working on a project. Then closing attorneys, lenders and purchasers will have the ability to address those known potential interests at closing.

- The law went into effect on April 1, 2013.
- It involves a simple 3-step process:

Step 1: Appointment of Lien Agent:

When a construction project is contracted, the owner of the property (or their contractor on their behalf) designates a Lien Agent, identifying the property and any pre-permit contractors or subcontractors, including design professionals (architects, engineers, surveyors and landscape architects) who have worked on the property. (Appointments are *not* required for improvements under \$30,000 *or* to the owner's existing residence—including accessory building or structures to the owner's existing residence *or* for public building projects.) Cost is payable by credit card and is \$25 for single family; \$50 for any other.

Step 2: Notice to Lien Agent:

Contractors and subcontractors (potential lien claimants) can then give notice that they wish to preserve their lien rights to the lien agent at any time before, during or after they have provided lienable labor, services, materials or rental equipment to the property. So long as this notice is prior to conveyance to a third party or mortgage to an unaffiliated lender (or within 15 days of the potential lien claimant's first furnishing to the property, if later), the potential lien claimant has preserved the priority of any right it has to seek a claim of lien *on the property* under the existing mechanics's lien law.

Step 3: Searching for Filings:

Filings above can then be found through the system, including the contact and other information reported in the system by the above users. This allows all users to better monitor their construction projects and protect parties at closing.

Please visit www.liensnc.com for further information or for filings.

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances:
 - 1. Quantity allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices.

1.2 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.3 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

- A. Coordinate allowance items with other portions of the Work.

1.5 QUANTITY ALLOWANCES

- A. Quantity Allowance: An estimated quantity or extent of a product, assembly, or portion of the Work that cannot be measured prior to construction, but is reasonably anticipated.
- B. All costs for performing the work described under the quantity allowance are included in the allowance. These costs include materials, delivery, installation, taxes, insurance, equipment rental, and similar costs, and Contractor's overhead and profit.
- C. When work is performed and actual quantity or extent is measured, the Contract Sum will be adjusted by Change Order based on Unit Cost indicated in the Agreement.

1.6 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order Proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.
- C. Unused amounts of moneys that define the value of the allowances, included integrally in the work and materials allowances, shall be credited to the Owner by deduct change order prior to approval of Final Application for Payment.

PART 2 - PRODUCTS (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 UNSUITABLE SOIL ALLOWANCE

- A. Work shall include in the Base Bid Proposal sufficient funds to replace the quantity of Unsuitable Soil listed under the Schedule of Allowances below.
1. The term "cubic yards" used in relation to the Unsuitable Soil Allowance shall be defined as cubic yards of undisturbed material in-place. Under no conditions will the term "cubic yard" refer to "loose", "truck" or "disturbed" material.
- B. Soil removal, soil replacement, and other earthwork indicated on the Drawings shall be included in the Base Bid and are not to be included in this allowance. The allowance shall provide for unanticipated soil replacement in excess of the Scope of Work indicated on Drawings.
- All soil replacement is unclassified.
- C. Replacement of unsuitable soil is defined as including:
1. Excavation of unsuitable material, mechanical or manual means as indicated.
 2. Disposal of unsuitable material on-site or off-site as indicated.

3. Supply of new satisfactory material acceptable to the Engineer from on-site or off site as indicated. Refer to Earthwork specifications for description of satisfactory backfill material.
 4. Installation of new material including compaction as required.
- D. Final Payment for unsuitable soil replacement performed as work of this Section shall be made as follows:
1. The total quantity of unsuitable soil replacement shall be determined by an independent surveyor or testing agency paid by the Owner and acceptable to the Contractor. The Unit Price per the Contract/Agreement for unsuitable soil replacement shall be multiplied by the actual unsuitable soil replacement quantity. This product shall be defined as the "Actual Cost."
 2. The unit price listed on the Contract/Agreement for Unsuitable Soil Replacement shall be multiplied by the Unsuitable Soil Allowance quantity listed under the Schedule of Allowances below. This product shall be defined as the "Allowance Amount."
 3. The Contractor shall be paid that portion of the Actual Cost which exceeds the Allowance Amount. The Contract Sum shall be reduced by that portion (if any) of the Allowance Amount which exceeds the Actual Cost.
- E. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."

3.4 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Include interior and exterior access doors, 24 by 24-inches, for above-ceiling access. Allowance includes cutting, patching, and finishing as required to install access doors.
1. Interior Recessed Access Doors: Nine.
 2. Exterior Flush Access Doors: Nine.
- B. Allowance No. 2: Include 50 cu. yd. of unsuitable soil mechanical excavation.
- C. Allowance No. 3: Include 50 cu. yd. of off-site unsuitable soil disposal.
- D. Allowance No. 4: Include 50 cu. yd. of placement and compaction of off-site engineered fill.
- E. Allowance No. 5: Include 20 cu. yd. of placement and compaction of #57 Stone.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See 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 schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1A:
 - 1. Description: Interior Recessed Access Door, 24 by 24-inches, including cutting, patching, and finishing as required for installation.
 - 2. Unit of Measurement: Each.
- B. Unit Price No. 1B:
 - 1. Description: Exterior Flush Access Door, 24 by 24-inches, including cutting, patching, and finishing as required for installation.
 - 2. Unit of Measurement: Each.
- C. Unit Price No. 2:
 - 1. Description: Unsuitable Soil Removal (Mechanical Excavation).
 - 2. Unit of Measurement: Cubic Yard.

D. Unit Price No. 3:

1. Description: Off-Site Unsuitable Soil Disposal.
2. Unit of Measurement: Cubic Yard.

E. Unit Price No. 4:

1. Description: Place and Compact Off-Site Engineered Fill.
2. Unit of Measurement: Cubic Yard.

F. Unit Price No. 5:

1. Description: Place and Compact #57 Stone.
2. Unit of Measurement: Cubic Yard.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: State the amount (cost difference) to be added to the base bid to remove aluminum cap at existing interior glass railing and aluminum handrail at existing stairs. Replace with wood cap at glass rail and wood handrail.
- B. Alternate No. 2: State the amount (cost difference) to be added to the base bid to remove existing guardrail-height wall at existing stair down to steel stringer. Install new glass rail with wood cap.

- C. Alternate No. 3: State the amount (cost difference) to be added to the base bid to remove portion of wall beneath stair as shown on Drawings. Install "pass-through" opening, built-in cubbies on each side, and lighting as indicated on Drawings.
- D. Alternate No. 4: State the amount (cost difference) to be added to the base bid to remove portion of wall beneath stair as shown on Drawings. Install interior storefront, new ceiling, lighting, power, and data as indicated on Drawings.
- E. Alternate No. 5: In lieu of gypsum board infill panels, state the amount (cost difference) to be added to the base bid to provide stretched fabric wall systems as shown on the Drawings and as specified in Section 097713 "Stretched-Fabric Wall Systems."
- F. Alternate No. 6: In lieu of manufacturers specified as base bid, state the amount (cost difference) to be added to the base bid to provide the following door hardware by the following manufacturers (no substitutions), as indicated on Drawings and described in Specifications.
 - 1. Alternate No. 6A: Locks and Latches: Schlage L9000 series
 - 2. Alternate No. 6B: Cylinders/Cores: Schlage Everest 7-pin Small Format Interchangeable Core
 - 3. Alternate No. 6C: Panic Hardware: Von Duprin 98 Series
 - 4. Alternate No. 6D: Keyed Removable Mullions: Von Duprin KR4954/9954 Series
 - 5. Alternate No. 6E: Closers: LCN 4011/4111 Series

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. 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 that are not required in order to meet other Project requirements but may offer advantage to Owner.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form:
 - a. During Bidding: Use form included in Project Manual.
 - b. During Construction: Use form included in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or 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. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - d. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - 1) Contractor shall provide a marked-up specification section to provide a point-by-point comparison between the specified product and the proposed substitution. The point-by-point comparison shall indicate each point of compliance, non-compliance, and variance between the specified and proposed product.
 - e. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - f. Evidence that proposed product provides specified warranty.

- g. Project specific samples, where applicable or requested, including samples for initial selection, if required to establish color, texture, or pattern similar to products indicated; and samples for verification where specified or requested.
 - h. Certificates and qualification data, where applicable or requested.
 - i. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - j. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - k. Research reports evidencing compliance with building code in effect for Project.
 - l. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - m. Cost information, including a proposal of change, if any, in the Contract Sum.
 - n. 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.
 - o. 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.
3. 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.
- a. Forms of Acceptance:
 - 1) During Bidding: Addendum.
 - 2) During Construction: Change Order, Field Order, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

1.5 COORDINATION

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions During Bidding: Refer to Form OC-15 Instructions to Bidders and General Conditions of the Contract and Supplementary Instructions to Bidders and General Conditions of the Contract for timing of substitution requests and outline of substitution procedures during bidding.
- B. Substitutions for Cause During Construction:

1. Requests for substitution following award of contract must comply with requirements of this article and are restricted to those necessitated by the following circumstances:
 - a. Specified product is no longer available for purchase.
 - b. Specified product is not available within schedule requirements of project.
 - c. Specified product is not compatible with other product approved for project.
 - d. Specified warranty is not available from any manufacturer.
- C. Substitutions, General:
 1. Requests that do not include the completed form, including point-by-point comparison, and authorized signature will not be reviewed.
 2. Include sufficient data with request so that direct comparison of proposed item to specified item can be made. Knowledge and experience of applicator and warranty may be an integral part of specification. Provide data applicator/installer qualifications, such as experience, organizations, references, projects, and dates.
 3. Verify that submitted product meets requirements indicated before submitting request, and note any deviations. Inadequate warranty, vagueness of submittal, failure to meet project requirements, or insufficient data may be cause for disapproval of request. Architect's rejection of requested substitution is final, and does not require documentation or further justification. Architect's approval is subject to reconsideration at any time in life of Contract, if evidence is later discovered that proposed substitution is incompatible or fails to comply with indicated performance or other requirements.
 4. Approvals are based upon the opinion, knowledge, information, and belief of the Architect at time of issuance of approval and reliance upon data submitted. Approvals are subject to reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed. In proposing items for approval, Bidder/Contractor assumes all risks, costs, and responsibilities for product's acceptance by authorities having jurisdiction, integration into Work, and performance.
- D. 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:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution will not adversely affect Contractor's construction schedule.
 - c. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - d. Requested substitution is compatible with other portions of the Work.
 - e. Requested substitution has been coordinated with other portions of the Work.
 - f. Requested substitution provides specified warranty.
 - g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- E. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

CONTRACTOR'S REQUEST FOR SUBSTITUTION

Project: UNCW CIS Building Improvements
To: LS3P
Wilmington, NC
Attn.: Laura Miller
Phone: 910-790-9901
Fax: 910-790-3301
Email: lauramiller@ls3p.com

Project No.: 7202-191372
Specification Section #: _____
Contractor: _____
Requested by: _____
Phone: _____
Fax: _____
Email: _____

Reason for not providing specified item: _____

Savings to Owner for accepting substitution: _____

Specified Product/Fabrication Method

(List name/description; model no.; manufacturer): _____

Required Information for **Specified** Product:

Point by Point Comparative Product Data

Tests

Reports

Fabrication Drawings

Samples (Where Applicable)

Attached:

☐☐☐☐☐

Proposed Product/Fabrication Method

(List trade name/description; model no.; manufacturer): _____

Required Information for **Proposed** Product:

Point by Point Comparative Product Data

Tests

Reports

Fabrication Drawings

Samples (Where Applicable)

Attached:

☐

(Required)

☐☐☐☐

List of Related Changes/Modifications: _____

Differences between proposed substitution
and specified product: _____

Proposed product/fabrication method

affects other parts of the Work

☐

No

☐

Yes: Explain

CONTRACTOR'S REQUEST FOR SUBSTITUTION

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.
- Proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- Failure of proposed substitution to produce indicated results will not be considered grounds for additional payment or time.

For the Contractor:

Submitted by: _____
Signed: _____
Firm: _____
Telephone: _____
Fax: _____
Email: _____

For the Manufacturer:

Submitted by: _____
Signed: _____
Firm: _____
Telephone: _____
Fax: _____
Email: _____

END OF CONTRACTOR'S REQUEST FOR SUBSTITUTION

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 1) Excavation Related Changes: Contractor shall coordinate with Owner's testing agency to determine in-place quantities of undisturbed material for changes in the Work relating to soil removal, hauling, disposal and/or placement. Loose, truck, or disturbed material measurements are not acceptable. Claims for quantities not verified by the testing agency are subject to rejection by the Owner.
 - 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. Proposals for subcontractor costs, included as back-up, shall be submitted on the subcontractor's company letterhead.
 - e. 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.
- B. Contractor-Initiated Work Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 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.

- a. Excavation Related Changes: Contractor shall coordinate with Owner's testing agency to determine in-place quantities of undisturbed material for changes in the Work relating to soil removal, hauling, disposal and/or placement. Loose, truck, or disturbed material measurements are not acceptable. Claims for quantities not verified by the testing agency are subject to rejection by the Owner.
 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. Proposals for subcontractor costs, included as back-up, shall be submitted on the subcontractor's company letterhead.
 6. 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.
 7. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
- C. Change Proposal Form: Use form provided in Project Manual.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on State Construction Change Order Form OC-24.
- B. In order to facilitate checking of quotations for extras or credits, proposals shall be accompanied by a complete itemization of costs including labor, materials, and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

1.5 FIELD ORDER

- A. Field Order: Architect may issue a work directive on State Construction's Field Order Form. Field Order instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Contractor shall expedite cost and time extension estimates to allow Field Order to be processed in a timely manner.
 1. Field Order 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 Field Order.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

CHANGE PROPOSAL WORKSHEET SUMMARY

UNCW CIS Building Improvements
LS3P Project No.: 7202-191372

University of North Carolina at Wilmington, Owner
Contract Document Date: _____, 20____
Bulletin No. _____, Date: _____, 20____

A. NOTICE TO CONTRACTOR

1. Use this form as a cover sheet and summary for costs associated with Field Orders, Requests for Proposal, and Change Orders. Use one form for Contractor, and a form for each subcontractor. Indicate allowable overhead and profit for Contractor, subcontractors, and sub-subcontractors in accordance with the Conditions of the Contract.

B. MATERIALS

1. Direct Cost of Materials \$ _____
a) Attach list with quantity, item, unit cost, unit manhours, total manhours, OT manhours, total cost.
2. Overhead and Profit on Item B.1. \$ _____
a) Include ____% max. for small tools & consumables
3. Sales Tax \$ _____
4. Shipping and Transportation \$ _____
5. Materials Subtotal \$ _____

C. LABOR

1. Direct Cost of Labor: Hours: _____ @ _____ /hr. \$ _____
a) Include time sheets if requested.
2. Overhead and Profit on Item C.1. \$ _____
a) Show O & P percentage on straight labor cost, not on premium portion.
b) O & P includes supervisor's time.
3. Payroll Taxes and Insurance @ _____ % \$ _____
4. Labor Subtotal \$ _____

D. EQUIPMENT RENTAL

1. Equipment Rental \$ _____
a) Include quotes and pick-up/delivery tickets.
2. Overhead and Profit on Item D.1. (____% maximum) \$ _____
3. Equipment Rental Subtotal \$ _____

E. SUBCONTRACTORS

1. Subcontractors \$ _____
a) Include quotes with material and equipment back up
2. Overhead and Profit on Item E.1. (____% maximum) \$ _____
3. Subcontractor Subtotal \$ _____

F. SUBTOTAL OF PROPOSAL

1. Bonds (____% of Subtotal of Proposal) \$ _____

G. TOTAL OF CHANGE PROPOSAL

\$ _____

CHANGE PROPOSAL WORKSHEET SUMMARY

H. TIME EXTENSION REQUEST:

1. Number of Days: _____ Schedule Activity # Affected: _____
2. Number of Days: _____ Schedule Activity # Affected: _____
3. Number of Days: _____ Schedule Activity # Affected: _____
4. Total Number of Days, this Proposal: _____

I. CONTRACTOR'S SIGNATURE:

1. Contractor: _____
Company Name
2. Prepared By: _____
Name
3. Date: _____

J. ATTACHMENTS:

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 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.

1.3 SCHEDULE 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 other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- 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. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Description of the Work.
 - b. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 - 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

- a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. 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.
7. 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.

1.4 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 Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Final Acceptance, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
 1. Submit draft copy of Application for Payment prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values. Use updated schedule 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 at time of Application for Payment.
 3. Include amounts of approved Change Orders after all signatures are executed.
 4. Provide Sales and Use Tax Report with each Application for Payment.
- E. 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 documentation as required by Owner and Architect, including but not limited to, certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
- F. Transmittal: Submit five signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- G. Waivers of Mechanic's Lien: Owner reserves the right to require waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers with each Application for 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.
- H. 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. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. Data needed to acquire Owner's insurance.
- I. Retainage Reduction: Until the Work is 50 percent complete, the Owner shall pay 95 percent of the amount due to the Contractor on account of progress payments. At the time the Work is 50 percent complete and thereafter, the Contractor shall submit, for Owner's and Architect's review and approval a written request for retainage reduction. Upon Owner's approval, with written consent of the surety, the Architect may certify remaining partial payments to be paid in full.
1. The Contractor, as a condition precedent to retainage reduction, shall submit for review and approval by the Architect the required Operation and Maintenance Manuals.
- J. Application for Payment at Final Acceptance: After Architect issues the Certificate of Final Acceptance, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. Upon Final Acceptance of the work, the Contractor shall transmit the record set of Contract Documents to the Architect along with a typed list of each change or revision made during construction of the project. This list shall include change order numbers, authorization dates, and other information relevant to each change. Record Drawings must be received and approved prior to issuance of Final Payment.
- 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. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Final Acceptance or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
1. General coordination procedures.
 2. Coordination drawings.
 3. Requests for Information (RFIs).
 4. Project information management system.
 5. Project meetings.

1.2 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Prior to 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 and telephone numbers, including home, office, and cellular telephone 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 meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.3 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 assure proper performance of components where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.4 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to the following requirements:
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. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Review: Architect will review coordination drawings to verify that components requiring coordination have been included, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 3. Coordination Drawing Format: Provide coordination drawings according to requirements in Section 013300 "Submittal Procedures" for Shop Drawings and post to Project Information Management System.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 3. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

4. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
5. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
6. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
7. Fire-Protection System: Show locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

1.5 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI via the Project Information Management System.
 1. Architect will not respond to RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form within Project Information Management System.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will not be reviewed:
 - 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 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 10 days of receipt of the RFI response.
- E. RFI Log: The Project Information Management System will create and maintain the RFI log.
- F. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- 1.6 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM
- A. The Architect has established a web-based Project Information Management System to facilitate communication and record-keeping during the project. Architect will provide access to Contractor's key personnel. Refer to www.NewForma.com.
1. Use Architect's web-based Project Information Management System for purposes of managing project communication and documentation until Final Completion.
 2. Due to the size restrictions on email communication, all electronic files must be submitted through NewForma. Architect assumes no responsibility for information not received by Contractor's failure to use NewForma and such loss or delay of information will not be considered as a delay claim.
- B. Project Information Management System shall include the following functions:
1. Project directory.
 2. Project correspondence.
 3. Meeting minutes.
 4. Contract modifications forms and logs.
 5. RFI forms and logs.
 6. Submittals forms and logs.
 7. Reminder and tracking functions.
 8. Task and issue management.
 9. Photo documentation.
 10. Schedule and calendar management.
 11. Payment application forms.
 12. Drawing and specification document hosting, viewing, and updating.

13. Online document collaboration.
14. Archiving functions.

- C. Contractor, subcontractors, and other parties granted access by Contractor to Project Information Management System shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record discussions and agreements achieved. Distribute the meeting minutes to attendees, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before Contractor starts construction, at a time convenient to Owner and Architect.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - 1) GFRC columns and cornices.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
 - z. Bonds and insurance.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site, a minimum of two weeks before the beginning of each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner 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.
 - 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 conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Architect will conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Status Report: Contractor shall provide written report outlining the following:
 - a. Work done in last 30 days.
 - b. Work scheduled for next 30 days.

- c. RFI status.
 - d. Submittal status.
 - e. Allowance recap.
 - f. Pre-Installation meetings scheduled.
 - g. Narrative of progress schedule status.
4. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
5. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. 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.
- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.

2. PDF electronic file.
 - B. Startup construction schedule.
 - C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 1. Initial schedule shall be submitted with signatures of prime subcontractors, indicating their acceptance of schedule.
 2. Submit a working electronic copy of schedule, labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
 - D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, 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 all 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 all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - E. Construction Schedule Updating Reports: Submit with Applications for Payment.
 - F. Daily Construction Reports: Submit at monthly intervals.
 - G. Site Condition Reports: Submit at time of discovery of differing conditions.
 - H. Special Reports: Submit at time of unusual event.
- 1.4 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.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Acceptance.
 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.
 2. The Contractor shall conduct his operations so the completion date in the Agreement is met.
- B. Activities: Treat each story 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 Architect.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Concrete Slabs: Schedule, coordinate, and install concrete slabs in a timely manner to allow concrete to cure sufficiently for moisture-sensitive floor finishes. Failure to do so, resulting in the requirement for moisture mitigation, will be Contractor's responsibility.
 5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 6. Beneficial Occupancy: Indicate completion in advance of date established for Beneficial Occupancy, and allow time for Architect's administrative procedures necessary for certification of Beneficial Occupancy.
 7. Punch List and Final Acceptance: Include not more than 30 days or the number of days indicated in the Agreement for punch list and Final Acceptance.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
Subcontract awards.
 - a. Submittals.
 - b. Purchases.
 - c. Mockups.
 - d. Fabrication.
 - e. Sample testing.
 - f. Deliveries.
 - g. Installation.
 - h. Tests and inspections.
 - i. Adjusting.
 - j. Curing.
 - k. Startup and placement into final use and operation.
 2. 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:
Structural completion.
 - a. Temporary enclosure and space conditioning.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Beneficial Occupancy.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Beneficial Occupancy, and Final Acceptance.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.

5. Pending modifications affecting the Work and Contract Time.
- F. 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.
- G. 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, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. 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 45 days after date established for the Notice to Proceed.

Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- C. 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:

Preparation and processing of submittals.

- a. Mobilization and demobilization.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 - f. Testing.
 - g. Punch list and Final Acceptance.
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.

Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Float: Indicate float time for each activity.
- D. 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.
- E. 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.
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 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.
- G. Causes for Extensions of Time:
 1. The Contract completion date will be adjusted only for causes specified in the Contract. In the event the Contractor requests an extension of the Contract completion date, the Contractor shall furnish justification and supporting evidence as required by this Section and the General Conditions. The Owner will, after receipt of such justification and supporting evidence, make findings of fact and advise the Contractor in writing thereof. If the Owner determines that the Contractor is entitled to an extension of the Contract completion date, the Owner's determination of the time extension owed shall be based upon the approved CPM schedule or update. Actual

- delays in activities, which do not affect the scheduled Contract completion date, shall not serve as the basis for a change in Contract completion time.
2. The procedure for preparing and presenting delay justification is as follows:
 - a. Create a schedule activity (or activities) that represent the scope of the change or delay.
 - b. Assign durations and cost/manpower resources to these new activities.
 - c. Determine appropriate logic ties for these new activities. Assign predecessors and successors so that these activities can tie into the existing schedule activities.
 - d. These impact activities should be loaded into a separate copy of the updated schedule that immediately precedes the impact issue's time frame. For instance, if an impact issue occurs during mid-April, the new activities should be input into the March 31 (status date) update.
 - e. Recalculate the Schedule with these impact activities in place.
 3. The Impacted Schedule, along with the backup data describing the new schedule activities and logic ties which comprise the impact/delay issues, will be submitted to the Owner for review and approval. If approved, these impact/delay issues will become a permanent part of the Project Schedule. The Contractor shall not unilaterally make changes to the Project Schedule to justify schedule impacts without the approval of the Owner.
 4. Activity delays shall not automatically mean that an extension of the Contract Time is warranted or due the Contractor. Only those delays which impact the imposed Contract Completion Date or other CPM and contract milestone dates will be considered for time extensions.
 5. Failure of the Contractor to furnish justification and supporting evidence for an extension of time, as detailed in this Section, within thirty (30) calendar days of the changed condition shall constitute a waiver of any claims for time extension associated with the issue.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Beneficial Occupancy 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.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: 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, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Original target dates shall be retained in scheduling software for the duration of the Project.
 2. 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.
 3. 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.
 4. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Predemolition photographs.
 - 2. Periodic construction photographs.

1.2 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit unaltered, original, full-size image files within three days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 - 2. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Date photograph was taken.
 - c. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Images: Maintain one set of images accessible in the field at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- C. Predemolition Photographs: Before commencement of demolition, 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. Provide a minimum of 15 photographs showing existing building conditions adjacent to or adjoining the construction area to accurately record physical conditions prior to starting the Work.
- D. Additional Photographs: Architect may request photographs in addition to preconstruction photographs specified. Architect will determine number and frequency of photographs and general directions on vantage points.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect 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.
 - a. Long lead time materials include, but may not be limited to, GFRC column covers and cornices.
 - 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings are available from Architect for Contractor's use in preparing submittals.
 - 1. Upon request, Architect will furnish Contractor digital data drawing files of the Contract Drawings for use in preparing Shop Drawings, Coordination Drawings, and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD translated from Revit file.

2. The digital data files are available under the following conditions:
 - a. Contractor shall execute a data licensing agreement in the form of Digital Data Letter of Agreement included in Project Manual.
 - b. Digital data drawings are not to be considered Contract Documents as defined by the General Conditions for the Contract for Construction.
 - c. The Contract Documents executed or identified in the Owner/Contractor Agreement, shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.
 - d. The Contractor shall not transfer or reuse Instruments of Service in electronic or machine-readable form without the prior written consent of the Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction 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 different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as indicated in Article 5 of General Conditions of the Contract, OC-15. 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.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall be Specification Section number followed by a hyphen and then a sequential number (e.g. 081113 - 01 HM Doors and Frames). Resubmittals shall include a digital suffix after another hyphen (e.g. 081113 - 01 - 01 HM Doors and Frames).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from Project Information Management System.
 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Architect.

- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. 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.
- H. 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.
- I. 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.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Project Information Management System specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Action Submittals: Submit electronic copies of each submittal unless otherwise indicated.
 - 4. Informational Submittals: Submit electronic copies of each submittal unless otherwise indicated.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.

- h. Availability and delivery time information.
 - 4. Submit Product Data before or concurrent with Samples.
 - 5. Submit Product Data in PDF electronic file format.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - 3. Submit Shop Drawings in PDF electronic file format.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - 6. 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.
 - 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.
- E. 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.
 5. Submit product schedule in PDF electronic file format.
- F. 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.
- G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. 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.
- I. 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.
- J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- L. 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.
- M. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- N. 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:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- O. 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.
- P. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- Q. 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.
- R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. Professional Engineer Qualifications: Professional engineer performing delegated-design services shall be legally qualified to practice in jurisdiction where Project is located and shall be experienced in providing engineering services of the kind indicated.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, annotate to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
 - 1. No Exceptions Taken: The work covered by the submittal may proceed.
 - 2. Note Markings: The work covered by the submittal may proceed provided it complies with both the Architect's notations and corrections on the submittal and the Contract Documents.
 - 3. Rejected: Do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the contract document.
- C. Informational Submittals: Architect will review each submittal and will return it, noting "No Action Taken." If it does not comply with requirements, Architect will return it noting "Revise and Resubmit." Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review, with notation "Revise and Resubmit."
- F. Submittals not required by the Contract Documents may be returned by the Architect without action, with notation "No Action Taken."

END OF SECTION 013300



DIGITAL DATA LETTER OF AGREEMENT

An Agreement Between the Architect and _____ (the "Transferee,"
either Original or Third Party, as the case may be) for Transfer of Digital Data

Architect: LS3P ASSOCIATES LTD.
101 N. Third Street, Suite 500
Wilmington, North Carolina 28401
Contact: Laura Miller, AIA

Transferee:
Original _____
3rd Party _____

Project No.: 7202-191372
Project Name: UNCW CIS Building Improvements
Location: Wilmington, North Carolina
Date:

The Architect will provide the following Digital Data, dated as of the particular transmission, to the Transferee **for information purposes only (NOT FOR CONSTRUCTION, COST ESTIMATES, OR FABRICATION):**

1. AutoCAD Version 2010:
 - a) 1 Plan per level per discipline
 - b) Individual sheets, partial plans, elevations
sections and details will not be translated.

Digital Data was prepared using the following:

Software: AutoCAD (.dwg) **Version:**

Digital Data to be delivered via the following media: Newforma Website posting

TERMS AND CONDITIONS

1. The Architect and its consultants make no representation as to the compatibility of the Digital Data with any hardware or software. The Transferee shall notify the Architect within five (5) business days of any problems associated with accessing and/or using the Digital Data.
2. The Transferee acknowledges and agrees that the Digital Data may change or degrade during the transfer process. The Transferee acknowledges and agrees that the Architect and its consultants may remove all indications of ownership from the Digital Data prior to transmission.
3. All Digital Data shall be considered the property of the Architect and/or its consultants and shall not be used for other Projects, for additions to this Project, or for completion of this Project without the prior written permission of the Architect and/or its consultants. Digital Data shall not be re-transmitted by the Original Transferee to a Third Party Transferee without prior execution of an agreement identical to this Agreement between the Architect, the Original Transferee, and the Third Party Transferee. Under no circumstances shall the transmission of the Digital Data be considered a sale of goods or a sale of copyrights.
4. **THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS HEREBY EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES, BOTH EXPRESS AND IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AS WELL AS ANY WARRANTY OF ACCURACY, COMPLETENESS, AND/OR PERMANENCE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.** Addenda information and/or revisions made to the most current Digital Data after any date of transmission may not have been incorporated into the transmitted Digital Data. In the event of a



conflict between the Architect's printed instruments of service (whether sealed or not) and the Digital Data, the printed instruments of service shall govern. The Transferee acknowledges and agrees that the duty to determine the existence of any and all conflicts between the Digital Data and any other information upon which the Transferee relies rests solely upon the Transferee. The Digital Data shall not be considered Contract Documents or Construction Documents as defined by any General Conditions of Contract for Construction. The Digital Data is being provided on a strictly "AS IS" basis.

5. The use and/or provision of the Digital Data prepared by the Architect and/or its consultants shall not in any way reduce or obviate the Transferee's duty to check and coordinate dimensions, details, and quantities of materials as required to facilitate construction of the Project in a complete and quality manner consistent with the applicable standards of care. Confirmation of existing conditions is the sole responsibility of the Transferee.

6. The Transferee agrees to the extent permitted by applicable law, to indemnify, hold harmless, release, and defend the Architect and/or its consultants, their officers, shareholders, employees, and sub-consultants from any and all injuries, claims, demands, expenses, suits, liabilities, losses, damages, costs, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses related to the Digital Data, including but not limited to, attorneys' fees, expert witness fees, and court costs arising out of or in any way related to or connected with any negligent act and/or omission in the generation, provision, and/or use of the Digital Data by the Transferee and/or any of its subcontractors, suppliers, and/or consultants and waive any and all rights to such claims and causes of action.

7. The Transferee waives damages against the Architect for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, and/or claim expenses arising out of or relating to this Agreement and/or generation, provision, and/or use of the Digital Data, including, but not limited to, consequential damages and reasonable attorneys' fees and defense costs.

8. The Architect's and/or the Architect's consultants' liability to the Transferee and/or any of its subcontractors, suppliers, and/or consultants for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses arising out of or relating to this Agreement and/or the Digital Data, including, but not limited to, reasonable attorneys' fees and defense costs, regardless of the nature of the claim or damage, shall not exceed, either individually or in the aggregate, the total amount of \$1,000.00. Such causes include, but are not limited to, the Architect's and/or the Architect's consultants' negligence, errors, omissions, strict liability, breach of contract, and/or breach of warranty.

9. To the best of the Architect's knowledge, information and belief, there are no licensing or copyright fees due to others based on the transmission of the Digital Data, but to the extent that such unknown fees do exist, the Transferee agrees to pay the required fees and hold the Architect and/or its consultants harmless from any associated costs or penalties.

10. Upon execution of this Agreement, the Architect grants to the Transferee a non-exclusive, non-transferable (except as set forth herein) license to use the Digital Data solely and exclusively for informational purposes only, provided that the Transferee substantially performs its obligations under this Agreement.

11. Any purchase order number provided by the Transferee is for the Transferee's accounting purposes only. The Transferee acknowledges and agrees that purchase order terms and conditions are null, void, and inapplicable to this Agreement.

12. This Agreement constitutes the entire agreement between the parties relative to the Digital Data and shall be governed by the laws of the State of North Carolina.



AUTHORIZED ACCEPTANCE

by Architect:
LS3P ASSOCIATES LTD.

Signature

Print Name and Title

Date

by Third Party Transferee:

Signature

Print Name and Title

Date

WE SO CONSENT:

by Owner:

Signature

Print Name and Title

Date

by Original Transferee:

Signature

Print Name and Title

Date

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- 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.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

- 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 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.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

- A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.7 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, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and 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, and telephone number 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 whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar 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 for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Testing equipment shall be calibrated at maximum 12 month intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
1. Submit copy of certificate of calibration, made by accredited calibration agency.
- I. 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.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

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 inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 1. 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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting 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 inspecting 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. 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."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. The testing agency and its representatives do not have the authority to authorize work or changes in the Work.
 3. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 4. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 5. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

6. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 7. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

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 Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in 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 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

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

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
 - 1. ICC - International Code Council; www.iccsafe.org.
 - 2. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014533 - SPECIAL INSPECTIONS

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 P.E. or EIT.
 - 4. Inspectors performing inspections of prestressed concrete work may be ICBO/BOCA/SBCCI certified Prestressed 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 Special Inspector.
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 that is not certified and 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 reinspection 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 hand written 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)

Attached are the following forms:

- 1. Statement of Special Inspections
- 2. Schedule of Special Inspection Services
- 3. Final Report of Special Inspections
- 4. Final Report of Special Inspections (Agent's Final Report)
- 5. Contractor's Statement of Responsibility
- 6. Fabricator's Certificate of Compliance

END OF SECTION 014533

Statement of Special Inspections

Project: UNCW CIS Building Improvements, SCO ID # 19-21380-01A
Location: UNCW, Wilmington, NC
Owner's Representative: David Singley
Owner's Address: 601 S. College Road, Wilmington, NC 28403

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	Don R. Woods		
	(Type or print name)	(Signature)	(Date)
Architectural	Laura L. Miller		
	(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.

☒ Structural Steel & High Strength Bolting	☐ Helical Pile Foundations
☒ Welding of Structural Steel	☐ Rammed Aggregate Piers & Stone Columns
☒ Cold-Formed Steel Deck	☒ Sprayed Fire-Resistant Material
☒ Open-Web Steel Joists & Joist Girders	☐ Mastic & Intumescent Fire-Resistant Coatings
☐ Cold-Formed Steel Framing	☐ Exterior Insulation & Finish System
☒ Concrete Construction	☐ Fire-Resistant Penetrations & Joints
☐ Masonry Construction ^b	☐ Smoke Control
☐ Wood Construction	☐ Retaining Wall & Systems > 5 Feet
☒ Soils	☐ Special Inspections for Wind Resistance
☐ Driven Deep Foundations	☐ Special Inspections for Seismic Resistance
☐ 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 ☐ ≥120mph

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	☒	C		1704.2.5.1	
b. Review material test reports & certifications	☒	C	N5.2		
c. Collect certificates of compliance from the steel fabricator at completion of fabrication	☒	C		1704.5	
2. Inspections Prior to High-Strength Bolting at Pretensioned and Slip-Critical Joints					
a. Collect manufacturer's certifications for fastener materials	☐	C	Table (Tbl) N5.6-1		
b. Fasteners are marked per ASTM requirements	☐	P	Tbl N5.6-1		
c. Ensure correct fasteners and bolting procedures are selected for joint details	☐	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	☐	P	Tbl N5.6-1		
e. Observe and document pre-installation verification testing by installation personal for fastener assemblies and methods	☐	P	Tbl N5.6-1		
f. Verify proper storage provided for all fastener components	☐	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	☐	P	Tbl N5.6-2		
b. Verify joint brought to snug-tight condition prior to pretensioning	☐	P	Tbl N5.6-2		
c. Verify fastener components not turned by the wrench prevented from rotating	☐	P	Tbl N5.6-2		
d. Ensure fasteners are pretensioned in accordance with RCSC, progressing from the most rigid point towards free edges	☐	P	Tbl N5.6-2		
4. Document acceptance or rejection of bolted connections after high-strength bolting is complete	☐	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	☒	P	N5.7		
b. Inspection of fabricated assemblies & erected steel framing verifying compliance with the construction documents	☒	P	N5.7		
6. Composite Construction					
a. Verify placement & installation of steel deck	☒	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	☒	P	Tbl N6.1		

Schedule of Special Inspection Services
Welding of Structural Steel

Inspection Task	Task Req'd	Freq	Code Reference		Agent
			AISC 360	NCBC	
1. Inspections Prior to Welding			N5.4		
a. Collect & review welding procedure specification (WPS) and verify manufacturer certifications for welding consumables	☒	C	Table (Tbl) N5.4-1		
b. Confirm weld material type & grade	☒	P	Tbl N5.4-1		
c. Confirm method of welder identification	☒	P	Tbl N5.4-1		
d. Inspection of fit-up for groove & fillet welds including access hole configuration & finish	☒	P	Tbl N5.4-1		
2. Inspections During Welding			N5.4		
a. Verify welder qualifications	☒	P	Tbl N5.4-2		
b. Verify proper control and handling of welding consumables	☒	P	Tbl N5.4-2		
c. Monitor environmental conditions	☒	P	Tbl N5.4-2		
d. Monitor proper implementation of WPS	☒	P	Tbl N5.4-2		
e. Inspection of welding techniques including no welding over cracked tack welds	☒	P	Tbl N5.4-2		
3. Inspections After Welding			N5.4, N5.5		
a. Verify welds have been cleaned	☒	P	Tbl N5.4-3		
b. Confirm the installed size, length and location of welds matches the contract documents	☒	C	Tbl N5.4-3		
c. Verify welds meet visual acceptance criteria	☒	C	Tbl N5.4-3		
d. Confirm arc strikes comply with Part 5.28 of AWS D1.1	☒	C	Tbl N5.4-3		
e. Visually observe web k-area for cracks within 3" of welded doubler plates, continuity plates and stiffeners	☒	C	Tbl N5.4-3		
f. Backing and weld tabs removed per contract documents	☒	C	Tbl N5.4-3		
g. Observe and inspect weld repair activities	☒	C	Tbl N5.4-3		
h. For Risk Category III or IV structures, conduct ultrasonic testing (UT) of CJP groove welds in materials $\geq 5/16"$ at butt, T- and corner joints subject to transversely applied tension loading	☐	C	N.5.5b, N5.5e		
i. For Risk Category II structures, conduct ultrasonic testing (UT) of CJP groove welds in materials $\geq 5/16"$ at butt, T- and corner joints subject to transversely applied tension loading	☐	P	N.5.5b, N5.5f		
j. Conduct magnetic particle testing (MT) or liquid penetrant testing (PT) at thermally cut surfaces of access holes for rolled section with $t_f > 2"$ and built-up shape with $t_w > 2"$	☐	C	N5.5c		
k. Radiographic or ultrasonic inspection at joints subject to fatigue	☐	C	N5.5d, Tbl A-3.1		

I. Document acceptance / rejection of welded joints and members	☐	C	Tbl N5.4-3, N5.5g		

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	☒	C	Table (Tbl) 1.1		
2. Inspection Tasks After Deck Placement					
a. Verify the installation of deck & deck accessories complies with the construction documents	☒	C	Tbl 1.2		
b. Verify that deck materials' mill certifications comply with the construction documents	☒	C	Tbl 1.2		
3. Inspection Tasks Prior to Deck Welding					
a. Collect welding procedure specification (WPS)	☒	P	Tbl 1.3		
b. Collect manufacturer certifications for welding consumables	☒	P	Tbl 1.3		
c. Verify material type and grade	☒	P	Tbl 1.3		
d. Check welding equipment	☒	P	Tbl 1.3		
4. Inspection Tasks During Deck Welding					
a. Verify welder qualifications	☒	P	Tbl 1.4		
b. Verify proper control and handling of welding consumables	☒	P	Tbl 1.4		
c. Monitor environmental conditions	☒	P	Tbl 1.4		
d. Monitor proper implementation of WPS	☒	P	Tbl 1.4		
5. Inspection Tasks After Welding					
a. Verify size and location of welds, including support, sidelap and perimeter welds	☒	C	Tbl 1.5		
b. Verify welds meet visual acceptance criteria	☒	C	Tbl 1.5		
c. Observe weld repair activities	☒	C	Tbl 1.5		
6. Inspection Tasks Prior to Mechanical Fastening					
a. Verify manufacturer installation instructions available for mechanical fasteners	☒	P	Tbl 1.6		
b. Proper tools available for fastener installation	☒	P	Tbl 1.6		
c. Verify proper storage of mechanical fasteners	☒	P	Tbl 1.6		
7. Inspection Tasks During Mechanical Fastening					
a. Observe fastener spacing and position	☒	P	Tbl 1.7		
b. Verify fasteners are installed in accordance with manufacturer's instructions	☒	P	Tbl 1.7		
8. Inspection Tasks After Mechanical Fastening					
a. Check spacing, type and installation of support fasteners	☒	C	Tbl 1.8		
b. Check spacing, type, and installation of sidelap fasteners	☒	C	Tbl 1.8		
c. Check spacing, type, and installation of perimeter fasteners	☒	C	Tbl 1.8		

d. Verify repair activities	☒	C	Tbl 1.8		
9. Document acceptance or rejection of deck & deck accessories for all phases of construction	☒	C	Tbls 1.1 thru 1.8		
10.					

Schedule of Special Inspection Services
Open-Web Steel Joists and Joist Girders

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard	NCBC	
1. Fabricator Certification / Verification of Quality Control Procedures					
a. Verify fabricator qualifications	☒	C		1704.2.5.1	
b. Collect certificate of compliance from steel joist producer at completion of manufacture	☒	C		1704.5, 2207.5	
2. Observe bolted and welded joist end connections	☒	P	SJI-K 5.3, 5.6, SJI-LH/DLH 104.4, 104.7, SJI-JG 1004.4, 1004.6, SJI-CJ 104.4, 104.7	Table (Tbl) 1705.2.3	
3. Verify size, spacing and connection of standard horizontal and diagonal bridging	☒	P	SJI-K 5.4, SJI-LH/DLH 104.5, SJI-JG 1004.5, 1004.9, SJI-CJ 104.5	Tbl 1705.2.3	
4. Verify size, spacing and connection of bridging that differs from the SJI specifications listed by Part 2207.1 of the NCBC	☒	P		Tbl 1705.2.3	

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	☒	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	☐	P	ACI 26.6.4	1704.5	
f. Inspect single-pass fillet welds $\leq 5/16"$	☐	P	ACI 26.6.4		
g. Inspect all welds other than single-pass fillet welds $\leq 5/16"$	☐	C	ACI 26.6.4		
3. Concrete Anchors:					
a. Inspect anchors cast in concrete	☒	P	ACI 17.8.2		
b. Inspect adhesive anchors installed in hardened concrete with horizontally or upwardly inclined orientations that resist sustained tension loads	☒	C	ACI 17.8.2.4		
c. Inspect adhesive anchors installed in hardened concrete with orientations different from Item 3.b	☒	P	ACI 17.8.2		
d. Inspect mechanical anchors installed in hardened concrete	☒	P	ACI 17.8.2		
4. Collect mix designs and verify the correct mix used during installation	☒	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	☒	C	ASTM C172, ASTM C31, ACI 26.4, 26.12	1908.10	
6. Inspect concrete and shotcrete placement for proper application techniques	☒	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	☐	C		1704.5, 1908.5	
8. Verify maintenance of specified curing temperature and techniques	☒	P	ACI 26.5.3-26.5.5	1908.9	
9. Inspections for prestressed concrete					
a. Observe application of prestressing force	☐	C	ACI 26.10		
b. Inspect grouting of bonded prestressing tendons	☐	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	☐	P	ACI 26.11.2		
11. Inspect erection of precast members	☐	P	ACI 26.8		
12. Inspect formwork for shape, location and dimensions of the concrete member being formed	☐	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	☐	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
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	☒	P		1705.6	
2. Verify excavations extend to proper depth and have reached the correct soil material	☒	P		1705.6	
3. Perform classification and testing of compacted fill materials	☒	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	☒	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	☒	P		1705.6	

Schedule of Special Inspection Services
Sprayed Fire-Resistant Materials ^a

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard	NCBC	
1. Prior to the application of sprayed on fire resistant materials, verify structural member surfaces are prepared in accordance with the approved fire-resistance design and the written instructions of the approved manufacturer	☒	P		1705.14.2	
2. During the application of sprayed on fire resistant materials, verify that the following are in compliance:					
a. Substrate has minimum ambient temperature before and after application as specified by the fire resistance design and approved manufacturer's written instructions	☒	P		1705.14.3	
b. Work area properly ventilated during and after application				1705.14.3	
c. Thickness of sprayed on material conforms with the approved fire resistance design and NCBC minimums	☒	P		1705.14.4, 1705.14.4.4, 1705.14.4.5, 1705.14.4.6, 1705.14.4.7, 1705.14.4.8, 1705.14.4.9	
d. The density of sprayed on materials is not less than the requirements of the approved fire-resistance design	☒	P		1705.14.5	
e. The cohesive / adhesive bond strength is not less than 150 pounds per square foot	☒	P		1705.14.6	

a. Inspections shall be performed after the rough installation of electrical, automatic sprinkler, mechanical and plumbing systems, and suspension systems for ceilings.

Schedule of Special Inspection Services

FINAL REPORT OF SPECIAL INSPECTIONS

Project: UNCW CIS Building Improvements
Location: Wilmington, NC
Owner: University of North Carolina Wilmington

Owner's Address: 601 S. College Road, Wilmington, NC 28403

Architect of Record: Laura L. Miller, AIA

Structural Engineer of Record: Don R. Woods, PE

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

AGENTS FINAL REPORT OF SPECIAL INSPECTIONS

AGENT'S FINAL REPORT

Project: UNCW CIS Building Improvements

Agent:

Special Inspector:

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: UNCW CIS Building Improvements

Contractor's Name:

Address:

License No.:

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

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: UNCW CIS Building Improvements

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

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

Signature

Date

Title

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

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

- A. Water and Electric Power Service from Existing System: Water and electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- C. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained heaters with thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

PART 3 - EXECUTION

3.1 SITE USE PLAN

- A. Confine operations within the areas indicated and as shown on the site use plan and as permitted by law, ordinances, and permits. Site shall not be unreasonably encumbered with materials, products, or construction equipment.
- B. The Contractor in reviewing the use of the site shall include access to proposed building for construction purposes, parking where possible for employees, temporary facilities including offices, storage, and workshop sheds or portable trailers, utility hookups, staging areas, storage materials and products, and unloading space.

- C. The Contractor shall show additional area needed in the use of the site beyond that which may be indicated on the Drawings. Where additional fencing is required, such fencing shall be included at no additional cost to the Owner.

3.2 TEMPORARY UTILITIES

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder.
- B. Sanitary Facilities: Use of Owner's existing or new toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Final Acceptance, restore these facilities to condition existing before initial use.
- C. Heating: Provide temporary heating 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.

3.3 TEMPORARY FACILITIES

- A. Provide field offices, storage trailers, and other support facilities as necessary for the Work.
- B. Collect waste daily and, when containers are full, legally dispose of waste off-site.
 - 1. Handle hazardous, dangerous, or unsanitary waste materials in separate closed waste containers. Dispose of material according to applicable laws and regulations.
- C. Provide temporary enclosures for protection of construction and workers from inclement weather and for containment of heat.
- D. Project Sign: Comply with UNCW's Design and Construction Guidelines.
 - 1. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.
- E. Parking: Use designated areas of existing parking for construction personnel. Coordinate location with Owner.

3.4 TEMPORARY CONTROLS

- A. Provide temporary environmental controls as required by authorities having jurisdiction including, but not limited to, erosion and sediment control, dust control, noise control, and pollution control.
- B. Provide temporary barricades, warning signs, and lights to protect the public and construction personnel from construction hazards.
 - 1. Enclose construction areas with fences with lockable entrance gates, to prevent unauthorized access.
- C. Provide temporary fire protection until permanent systems supply fire-protection needs. Comply with NFPA 241.
- D. Temporary Partitions: Provide floor-to-ceiling dustproof non-combustible partitions to limit dust and dirt migration to completed areas.

1. Protect air-handling equipment.
2. Provide walk-off mats at each entrance through temporary partition.

3.5 TERMINATION AND REMOVAL

- A. Remove temporary facilities and controls before Final Acceptance. Personnel remaining after Final Acceptance will be permitted to use permanent facilities, under conditions acceptable to Owner.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
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.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Products:

- a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered subject to requirements of Section 012500 "Substitution Procedures."
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 2. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered subject to requirements of Section 012500 "Substitution Procedures."
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's 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 similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- 2.2 COMPARABLE PRODUCTS
- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the conditions of Section 012500 "Substitution Procedures" are satisfied. If the conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.

1.2 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by surveyor.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
- 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, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. 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.
- C. 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.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility, Architect, and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to 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. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
- C. Inform installers of lines and levels to which they must comply.
 - 1. Check the location, level and plumb, of every major element as the Work progresses.
 - 2. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 3. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- D. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- E. 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.
- F. 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 Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- 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.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until 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.
- 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: Do not use tools or equipment that produce harmful 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 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.

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. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. 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 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: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- 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 Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- 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. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 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. 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 PROGRESS CLEANING

- A. General: 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.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of 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 017419 "Construction Waste Management and Disposal."
- 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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

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

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Final Acceptance.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.3 PERFORMANCE REQUIREMENTS

- A. Contractor is encouraged to recycle as much nonhazardous construction waste as practical, without incurring additional costs to the Owner.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT AND DISPOSAL, GENERAL

- A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Review requirements established for recycling and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Beneficial Occupancy procedures.
 - 2. Final Acceptance procedures.
 - 3. Final cleaning.
 - 4. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Beneficial Occupancy.
- B. Certified List of Incomplete Items: Final submittal at Final Acceptance.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance/Extra Material Items: For maintenance material submittal items specified in other Sections.

1.5 BENEFICIAL OCCUPANCY PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Beneficial Occupancy: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Beneficial Occupancy. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance/extra material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.

- a. Schedule of Maintenance/Extra Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Beneficial Occupancy: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Beneficial Occupancy. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Beneficial Occupancy.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Beneficial Occupancy a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, and with the approval of State Construction Office, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Beneficial Occupancy after inspection, and with the approval of State Construction Office, or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Acceptance.

1.6 FINAL ACCEPTANCE PROCEDURES

- A. Submittals Prior to Final Acceptance: Before requesting final inspection for determining Final Acceptance, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Beneficial Occupancy inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine Final Acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, and with the approval of State Construction Office, Architect will either proceed with inspection

or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection, and with the approval of State Construction Office, or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order.
 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 Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in MS Excel electronic file format. Architect will return annotated file.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Beneficial Occupancy for entire Project or for a designated 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; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Remove labels that are not permanent.
- k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- l. Clean ducts, blowers, and coils that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- m. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- n. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Beneficial Occupancy.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following formats:
 - 1. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
 - 2. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Manual Submittal: Submit operation and maintenance manual prior to requesting inspection for Final Acceptance and at least 15 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit manuals in final form prior to requesting inspection for Final Acceptance.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. Table of contents.
- B. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

- C. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Project number.
 6. Name and contact information for Contractor.
 7. Name and contact information for Architect.
 8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals:
1. Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - a. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - 1) If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - 2) Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - b. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

- c. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 - d. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 - e. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - 1) If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - 2) If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.
2. Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
- a. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - b. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017836 - WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.2 DEFINITIONS

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- F. Warranty Commencement: Warranties required by the Contract Documents shall commence on the Date of Final Acceptance of the Work or designated portion thereof.

1.4 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Beneficial Occupancy.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
- C. Prepare a written document utilizing the sample "General Warranty" form located at the end of this Section, ready for execution by the Contractor. The Contractor shall submit subcontractor, supplier, or manufacturer draft warranties to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- D. Form of Submittal: At Final Acceptance compile two (2) copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 1. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017836

Attachment: Sample General Warranty

SAMPLE GENERAL WARRANTY

(To Be Printed on Company Letterhead. Letterhead Shall Include Phone and Fax Numbers)

GENERAL WARRANTY

Date:

Contractor: Name
Address
City, State, Zip Code

Owner: Name
Address
City, State Zip Code

Project: Name

Project Location: City, State

The above named contractor as the General Contractor for the Work on the above project, does hereby warrant that for a period of one (1) year from the date of the Date of Final Acceptance, the above Work that will remain free from all defects in workmanship and material, and that it will comply with all the specific requirements of the Contract Documents governing the Work.

Signature

Printed Name and Title

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
- B. Contractor shall provide required documentation and cooperate with Architect so that the Architect can prepare and furnish to the Owner, a record set of documents.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Submit one paper copy of marked-up record prints.
 - 2. Engineered Systems: For Manufacturer/Contractor engineered systems, i.e. fire protection systems, light gauge framing systems, panelized systems, etc., Contractor shall submit two sets of security protected record drawings as follows:
 - a. One in .DWG or acceptable CAD format (write protected);
 - b. One in .PDF format, with seals and signatures.
- B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda, contract modifications, and identification of manufacturer provided for each product.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.

- h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Field Order.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Note Field Order numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Specifications as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Coordinate with Owner for any existing warranties.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.8 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Arrange to shut off utilities with utility companies.
 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Cover and protect furniture, furnishings, and equipment that have not been removed.
4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
7. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

- B. Burning: Do not burn demolished materials.

3.6 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Suspended slabs.
- B. Related Sections:
 - 1. Division 32 for concrete pavement and walks.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Welding certificates.

- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
 - 4. Curing compounds.
 - 5. Bonding agents.
 - 6. Adhesives.
 - 7. Vapor retarders.
 - 8. Semirigid joint filler.
 - 9. Joint-filler strips.
 - 10. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
 - 1. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

- a. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
 - G. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 - f. Synthetic Fiber manufacturer or representative.
 - 2. Review testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
 - 3. Review floor finishes to be installed and coordinate with curing methods to be used.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- C. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

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

plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

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

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 1. Maximum Coarse-Aggregate Size: 3/4-inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
 1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI
 - b. BASF Construction Chemicals - Building Systems; Rheocrete CNI
 - c. Euclid Chemical Company; ARRMATECT, EUCON BCN, or EUCON CIA
 - d. GCP Applied Technologies; DCI
 - e. Sika Corporation; Sika CNI
- D. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.
 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
- b. FORTA Corporation; FORTA FERRO.
- c. Grace Construction Products, W. R. Grace & Co.; Strux 90/40.
- d. Nycon, Inc.; XL.
- e. Propex Concrete Systems Corp.; Fibermesh 650.
- f. Sika Corporation; Sika Fiber MS.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape. Maximum perm rating of 0.02.
 1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15
 - b. GCP Applied Technologies; Florprufe 120
 - c. Insulation Solutions, Inc.; Viper VaporCheck II
 - d. Meadows, W. R., Inc.; Perminator 15 mil
 - e. Raven Industries Inc.; Vapor Block 15
 - f. Reef Industries, Inc.; Griffolyn 15 mil Green
 - g. Stego Industries, LLC; Stego Wrap 15 mil Class A
 2. Provide manufacturer's compatible sealer system for penetrations.
- B. Granular Fill: Provide one of the following:
- C. Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- D. Clean sands with less than 3 percent fines. Materials to be verified by a qualified Geotechnical Engineer.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. BASF Construction Chemicals - Building Systems; Confilm
 - b. ChemMasters; SprayFilm
 - c. Conspec by Dayton Superior; Aquafilm
 - d. Dayton Superior Corporation; Sure Film (J-74)
 - e. Euclid Chemical Company (The), an RPM company; Eucobar
 - f. L&M Construction Chemicals, Inc.; E-CON
 - g. Meadows, W. R., Inc.; EVAPRE
 - h. Sika Corporation; SikaFilm
 - i. Symons by Dayton Superior; Finishing Aid
 - j. Unitex; PRO-FILM
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. Anti-Hydro International, Inc.; AH Clear Cure WB
 - b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB
 - c. ChemMasters; Safe-Cure & Seal 20
 - d. Conspec by Dayton Superior; Cure and Seal WB
 - e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal
 - f. Dayton Superior Corporation; Safe Cure and Seal (J-18)
 - g. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150
 - h. L&M Construction Chemicals, Inc.; Dress & Seal WB
 - i. Meadows, W. R., Inc.; Vocomp-20
 - j. Symons by Dayton Superior; Cure & Seal 18 Percent E

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Slump Limit: 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength - Typical Interior Slab: 3000 psi at 28 days.
 2. Minimum Compressive Strength: 4000 psi at 28 days.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: For exterior broom finished concrete only; 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
 5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 6. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 3.0 lb/cu. yd.
- C. Suspended Slabs: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Slump Limit: 4 inches plus or minus 1 inch.
 3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.12 Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 4.0 lb/cu. yd.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

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

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

PART 3 - EXECUTION

3.1 FORMWORK

- A. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- B. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.
- C. Construct forms tight enough to prevent loss of concrete mortar.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Following leveling and tamping of granular base for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of pour and face laps away from the expected direction of the placement whenever possible.
 - 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
 - 3. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 4. Apply seam tape to a clean and dry vapor barrier.
 - 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 6. Avoid the use of non-permanent stakes driven through vapor retarder.
 - 7. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
 - 8. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cu. yd. of concrete, nor less than once for each 5,000 sq. ft. of surface area for slabs or walls.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture

proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

9. 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.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 033000

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Precast concrete caps for planters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and finishes.
- B. Shop Drawings: Show fabrication and installation details for pre-cast concrete units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
- C. Samples:
 - 1. For each color and texture of precast concrete required.
 - 2. For colored mortar.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Material Test Reports: For each mix required to produce pre-cast concrete, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1.4 QUALITY ASSURANCE

- A. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- B. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Architectural Precast Association or the Precast/Prestressed Concrete Institute for Group A, Category AT.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metromont Corporation.
 - 2. Oldcastle Precast Building Systems.
 - 3. Shockey Precast Group.
 - 4. Tindall Corporation.
 - 5. Lucas
- B. Provide pre-cast concrete units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
 2. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 3. Provide drips on projecting elements unless otherwise indicated.
- C. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
- D. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- E. Colors and Textures: As selected by Architect from manufacturers full range.

2.2 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.
- B. Dowels: 1/2-inch- diameter, round bars, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner complying with requirements in Section 042000 "Unit Masonry," and expressly approved for intended use by pre-cast concrete manufacturer and cleaner manufacturer.

2.3 MORTAR

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar materials and mixes.
1. For setting mortar, use Type N.

2.4 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test precast units according to ASTM C 1364.
1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 SETTING PRECAST CONCRETE IN MORTAR

- A. Install pre-cast concrete units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set units in full bed of mortar with full head joints unless otherwise indicated.
1. Fill dowel holes and anchor slots with mortar.
 2. Fill collar joints solid as units are set.
 3. Build concealed flashing into mortar joints as units are set.
 4. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Provide sealant joints at copings and other horizontal surfaces, and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.2 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Pre-cast concrete units may be repaired if methods and results are approved by Architect.
- B. Replace pre-cast concrete units in a manner that results in units matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean pre-cast concrete units as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed pre-cast concrete units to comply with requirements in Section 042000 "Unit Masonry."

END OF SECTION 034500

SECTION 034900 - GLASS-FIBER-REINFORCED CONCRETE (GFRC)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes glass-fiber-reinforced concrete (GFRC) panels consisting of GFRC, panel frames, anchors, and connection hardware.
 - 1. GFRC panels include column covers and cornices.
- B. Special Conditions: Contractor is cautioned to expedite ordering and submittal process as required to accommodate long lead times for manufacturing and fabrication of GFRC column covers and cornices.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include GFRC design mixes.
- B. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:
 - 1. Panel elevations, sections, and dimensions.
 - 2. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
 - 3. Finishes.
 - 4. Joint and connection details.
 - 5. Erection details.
 - 6. Panel frame details for typical panels including sizes, spacings, thicknesses, and yield strengths of various members.
 - 7. Locations and details of connection hardware attached to structure.
 - 8. Sizes, locations, and details of flex, gravity, and seismic anchors for typical panels.
 - 9. Other items sprayed into panels.
 - 10. Erection sequence for special conditions.
 - 11. Relationship to adjacent materials.
 - 12. Description of loose, cast-in, and field hardware.
- C. Samples for Verification: For each type of finish indicated on exposed GFRC surfaces, representative of finish, color, and texture variations expected, approximately 12 by 12 inches by actual thickness.
- D. Delegated-Design Submittal: For GFRC panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Steel Sheet Certificates: For steel sheet used in cold-formed steel panel framing, mill certificates signed by manufacturers of steel sheet, or test reports from a qualified testing agency, indicating that steel sheet

used in cold-formed metal panel framing complies with requirements including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

- D. Mill Certificates: For structural-steel shapes and hollow structural sections used in panel framing.
- E. Source Quality-Control Program: For GFRC manufacturer.
- F. Source Quality-Control Test Reports: For GFRC, inserts, and anchors.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Designated a PCI-certified plant for Group G - Glass Fiber Reinforced Concrete or designated an APA-certified plant for GFRC production.
- B. Installer Qualifications: Manufacturer of GFRC panels.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - a. Include typical components, attachments to building structure, and methods of installation.
 - b. Include window opening with GFRC returns.
 - c. Include sealant-filled joint complying with requirements in Section 079200 "Joint Sealants."
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and transport GFRC panels supported on nonstaining material and with nonstaining resilient spacers between panels.
- B. Store GFRC panels off of ground on firm, level, and smooth surfaces supported on nonstaining material and with nonstaining resilient spacers between panels. Place stored panels so identification marks are clearly visible.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design GFRC panels, including panel frames, anchors, and connections.
- B. Structural Performance: GFRC panels, including panel frames, anchors, and connections, shall withstand the following design loads as well as the effects of thermal- and moisture-induced dimensional changes within limits and under conditions indicated:
 - 1. Design Loads: As indicated on Structural Drawings.
 - 2. Deflection Limits: Design panel frames to withstand design loads without lateral deflections greater than 1/240 of wall span.

3. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of 80 deg F.
 4. Design panel frames and connections to accommodate deflections and other building movements.
- C. PCI Manuals: Comply with requirements and recommendations in the following PCI manuals unless more stringent requirements are indicated:
1. PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."
 2. PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products."
- D. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. Arc Ltd.
 2. Casting Designs, Inc.
 3. Melton Classics, Inc.
 4. Stromberg Architectural Products, Inc.

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous GFRC surfaces within tolerances; nonreactive with GFRC and capable of producing required finish surfaces.
1. Mold-Release Agent: Commercially produced liquid-release agent that does not bond with, stain, or adversely affect GFRC surfaces and does not impair subsequent surface or joint treatments of GFRC.
- B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Provide solid backing and form supports to ensure that form liners remain in place during GFRC application. Use with manufacturer's recommended liquid-release agent that does not bond with, stain, or adversely affect GFRC surfaces and does not impair subsequent surface or joint treatments of GFRC.

2.4 GFRC MATERIALS

- A. Portland Cement: ASTM C150/C150M; Type I, II, or III.
1. For surfaces exposed to view in finished structure, use white of same type, brand, and source throughout GFRC production.
- B. Metakaolin: ASTM C618, Class N.
- C. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches long, specifically produced for use in GFRC, and complying with ASTM C1666/C1666M.
- D. Sand: Washed and dried silica, complying with composition requirements in ASTM C144; passing a No. 20 sieve with a maximum of 2 percent passing a No. 100 sieve.
- E. Facing Aggregate: ASTM C33/C33M, except for gradation, and PCI MNL 130, 1/4-inch maximum size.

1. Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match sample.
 2. Fine Aggregate: Natural or manufactured sand with a maximum of 5 percent passing a No. 100 sieve and a maximum of 3 percent passing a No. 200 sieve.
- F. Coloring Admixture: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
- G. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with chemical limits in PCI MNL 130.
- H. Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.
- I. Air-Entraining Admixture: ASTM C260/C260M, containing not more than 0.1 percent chloride ions.
- J. Chemical Admixtures: ASTM C494/C494M, containing not more than 0.1 percent chloride ions.

2.5 ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M, finished as follows:
1. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable.
- B. Carbon-Steel Bars: ASTM A108, Grade 1018, not less than 1/4 inch in diameter, finished as follows:
1. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable.
- C. Malleable-Iron Castings: ASTM A47/A47M, Grade 32510.
- D. Carbon-Steel Castings: ASTM A27/A27M, Grade 60-30.
- E. Bolts: ASTM A307 or ASTM F3125/F3125M, Grade A325 finished as follows:
1. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M, after fabrication, and ASTM A153/A153M, as applicable.
- F. Reglets: PVC extrusions.

2.6 PANEL FRAME MATERIALS

- A. Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members," with minimum uncoated steel thickness of 0.053 inch; with stiffened flanges, U-shaped steel track; and of the following steel sheet:
1. Metallic-Coated Steel Sheet: ASTM A653/A653M, structural-steel sheet, [G60] [G90] zinc coating, of grade required by structural performance of framing.
- B. Hollow Structural Sections: Steel tubing, ASTM A500/A500M, Grade B, or ASTM A513, finished as follows:
1. Finish: Shop primed with organic zinc-rich primer complying with SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Steel Channels and Angles: ASTM A36/A36M, finished as follows:

1. Finish: Shop primed with organic zinc-rich primer complying with SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2.7 GFRC MIXES

- A. Mist Coat: Portland cement, sand slurry, and admixtures; of same proportions as backing mix without glass fibers.
- B. Backing Mix: Proportion backing mix of portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.
- C. Polymer-Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry portland cement.
- D. Coloring Admixture: Not to exceed 10 percent of cement weight.

2.8 PANEL FRAME FABRICATION

- A. Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened.
 1. Fabricate panel frames using jigs or templates.
 2. Cut cold-formed metal framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3/D1.3M.
 4. Fasten framing members of hollow structural sections, steel channels, or steel angles by welding. Comply with AWS D1.1/D1.1M.
 5. Weld anchors to panel frames.
- B. Reinforce framing assemblies, as necessary, to withstand erection stresses.
- C. Galvanizing Repair: Touch up damaged galvanized surfaces according to ASTM A780/A780M.
- D. Painting Repair: Touch up damaged painted surfaces using same primer.

2.9 MOLD FABRICATION

- A. Construct molds that result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.
 1. Coat contact surfaces of molds with form-release agent.
- B. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during GFRC application. Coat form liner with form-release agent.
- C. Locate, place, and secure flashing reglets accurately.

2.10 GFRC FABRICATION

- A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.

- B. Spray Application: Comply with general procedures as follows:
1. Spray mist coat over molds to a nominal thickness of 1/8 inch on planar surfaces.
 2. Proceed with spraying backing mix before mist coat has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.
 3. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
 4. Measure thickness with a pin gage or other acceptable method at least once for every 5 sq. ft. of panel surface. Take no fewer than six measurements per panel.
- C. Hand form and consolidate intricate details, incorporate formers or infill materials, and overspray before material reaches initial set to ensure complete bonding.
- D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of 1/2 inch from GFRC backing, and without anchors protruding into GFRC backing.
- E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of 1/2 inch over tops of anchor feet, before initial set of GFRC backing. Measure bonding pad thickness at 25 percent of anchor locations.
- F. Inserts and Embedments: Build up homogeneous GFRC bosses or bonding pads over inserts and embedments to provide enough anchorage and embedment to comply with design requirements.
- G. Curing: Employ initial curing method that ensures sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.
1. Keep moisture off of the surfaces of mixes with polymer curing admixtures during the first three hours of curing. Maintain temperature between 60 and 120 deg F during the first 16 hours.
 2. Prevent drying of moist curing mixes during the first 24 hours. Maintain units in surface-damp condition at a temperature above 60 deg F and 95 percent relative humidity for seven days.
- H. Panel Identification: Mark each GFRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.
- I. Column Covers: Design and fabricate column covers for minimum joint width. Provide joint filler, flush to and matching adjacent surfaces, as approved by Architect.

2.11 FABRICATION TOLERANCES

- A. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.

2.12 FINISHES

- A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints, shall be uniform, straight, and sharp. Finish exposed-face surfaces of GFRC to match existing.

2.13 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels according to PCI MNL 130.
1. Test materials and inspect production techniques.
 2. Quality-control program shall monitor glass-fiber content, spray rate, unit weight, product physical properties, anchor pull-off and shear strength, and curing period and conditions.

3. Prepare test specimens and test according to ASTM C1228, PCI MNL 130, and PCI MNL 128 procedures.
4. Test GFRC inserts and anchors according to ASTM C1230 to validate design values.
5. Produce test boards at a rate of no fewer than one per work shift per operator for each spray machine and for each mix design.
 - a. For each test board, determine glass-fiber content according to ASTM C1229 and flexural yield and ultimate strength according to ASTM C947.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine structure and conditions for compliance with requirements for installation tolerances, bearing surfaces, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Install clips, hangers, and other accessories required for connecting GFRC panels to supporting members and backup materials.
- B. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
 1. Maintain horizontal and vertical joint alignment and uniform joint width.
 2. Remove projecting hoisting devices.
- C. Connect GFRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3/D1.3M requirements for welding, appearance, quality of welds, and methods used in correcting welding work.
 1. Protect GFRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.
- E. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

3.3 ERECTION TOLERANCES

- A. Erect GFRC panels to comply with the following noncumulative tolerances:
 1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
 2. Top Elevation from Nominal Top Elevation: As follows:
 - a. Exposed Individual Panel: Plus or minus 1/4 inch.
 - b. Nonexposed Individual Panel: Plus or minus 1/2 inch.
 - c. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
 - d. Nonexposed Panel Relative to Adjacent Panel: 1/2 inch.
 3. Support Elevation from Nominal Elevation: As follows:
 - a. Maximum Low: 1/2 inch.

- b. Maximum High: 1/4 inch.
- 4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet: 1 inch.
- 5. Plumb in Any 10 Feet of Element Height: 1/4 inch.
- 6. Maximum Offset in Alignment of Matching Edges: 1/4 inch.
- 7. Face Width of Joint: As follows (governs over joint taper):
 - a. Panel Dimension 20 Feet or Less: Plus or minus 1/4 inch.
 - b. Panel Dimension More Than 20 Feet: Plus or minus 3/8 inch.
- 8. Maximum Joint Taper: 3/8 inch.
- 9. Maximum Joint Taper in 10 Feet: 1/4 inch.
- 10. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch.

3.4 REPAIRS

- A. Repairs are permitted provided structural adequacy of GFRC panel and appearance are not impaired, as approved by Architect.
- B. Mix patching materials and repair GFRC so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces.
- C. Prepare and repair accessible damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Wire brush and clean accessible weld areas on prime-painted components and paint with same type of shop primer.
- E. Remove and replace damaged GFRC panels when repairs do not comply with requirements.

3.5 CLEANING AND PROTECTION

- A. Perform cleaning procedures, if necessary, according to GFRC manufacturer's written instructions. Clean soiled GFRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GFRC surfaces and staining of adjacent materials.

END OF SECTION 034900

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Clay face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Miscellaneous masonry accessories.

1.2 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. Show elevations of reinforced walls.

C. Samples:

1. Clay face brick, in the form of straps of five or more bricks.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
 - d. For masonry units, 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.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

- C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.4 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. 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.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. 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.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops net-area compressive strengths of 2,000 psi 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.

2.2 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 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.

2.3 CONCRETE MASONRY UNITS

- A. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,000 psi.
 - 2. Density Classification: Lightweight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
- 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 corners, jambs, sashes, movement joints, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.

2.4 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216.
 - 1. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 - a. Statesville Brick Company; Red Royal Special (Basis of Design)
 - b. Carolina Ceramics
 - c. Taylor Clay
 - 2. Grade: SW.
 - 3. Type: FBS.
 - 4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.

5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
6. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
7. Size (Actual Dimensions): Match existing.
8. Color and Texture: Custom match to existing building.

2.5 MORTAR AND GROUT MATERIALS

- A. 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.
- B. Hydrated Lime: ASTM C 207.
 1. Clay Face Brick: Type N.
 2. CMUs: Type S.
- C. Portland Cement-Lime Mix: ASTM C 270. Packaged blend of portland cement and hydrated lime containing no other ingredients.
 1. Clay Face Brick: Type N.
 2. CMUs: Type S.
- D. Mortar Cement: ASTM C 1329/C 1329M.
 1. Clay Face Brick: Type N.
 2. CMUs: Type S.
- E. Masonry Cement: Not permitted.
- F. 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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- G. Aggregate for Grout: ASTM C404.
- H. 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.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Addiment Incorporated; Mortar Kick
 - b. BASF Construction Chemicals - Building Systems; Trimix-NCA.
 - c. Euclid Chemical Company (The); Accelguard 80.
 - d. GCP Applied Technologies; Morset.
 - e. Sonneborn, Div. of ChemRex; Trimix-NCA
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ACM Chemistries; RainBloc for Mortar.
 - b. BASF Corporation, Construction Chemicals; Rheopel Mortar Admixture.
 - c. GCP Applied Technologies; Dry-Block Mortar Admixture.

- J. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
1. Exterior Walls: Hot-dip galvanized carbon steel.
 2. Wire Size for Side Rods: 0.148-inch diameter.
 3. Wire Size for Cross Rods: 0.148-inch diameter.
 4. Wire Size for Veneer Ties: 0.148-inch diameter.
 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry-Joint Reinforcement:
1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
 2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.

2.7 ANCHORS

- A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- B. Postinstalled Anchors: Provide chemical anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
1. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Pre-Compressed Joint Filler for CMU: Manufacturer's standard preformed, precompressed, closed-cell expanding foam sealant manufactured from 100 percent acrylic and impregnated with a nondrying, water-repellent agent. Factory produced in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. EMSEAL Joint Systems, Ltd.; BackerSeal (Basis of Design)
 - b. Dayton Superior Specialty Chemicals
 - c. Sandell Manufacturing Co., Inc.
 - d. Schul International, Inc.
 - e. Willseal USA, LLC
- B. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.

- C. 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.
- D. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 - 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM 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.
 - 3. For veneer masonry, use Type N.
 - 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 N.
- D. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

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. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. 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 composite walls and other masonry construction to full thickness shown.
- B. 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.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch 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 running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. 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.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- 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 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. General: Prepare mortar in accordance with current Portland Cement Association publications.

- B. Prepare fresh mortar at the rate it will be used, in order to maintain consistent color and workability. Do not use mortar that has stiffened because of hydration. Discard when not used within the time recommended by mortar manufacturer or PCA publications, whichever is shorter. Retemper mortar carefully to avoid color changes, no more than twice per batch.
- C. Measure mortar materials using cubic foot measuring box or other approved container of known volume, of size appropriate for operation. Use a consistent ratio of water to mortar materials, within the range recommended by the mortar manufacturer's written instructions.
 - 1. Measurement of sand by shovel shall not be permitted.
- D. Lay CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- E. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together as follows:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
- B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide individual metal ties not more than 16 inches o.c.
 - 2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.

3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings 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.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry 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 using one of the following methods:
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.
 - 2. At veneer side of masonry walls, install pre-compressed joint filler in CMU control joints during CMU installation.
 - a. Install at depth sufficient to allow installation of properly sized backer rod and liquid sealant in front of joint filler. Comply with manufacturer's written instructions.
 - 1) Install each length of joint filler immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of joint filler requires acceleration to produce seal, apply heat to joint filler in compliance with manufacturer's written instructions.
- C. Form expansion joints in brick as follows:
 - 1. Build in compressible joint fillers where indicated.
 - 2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

3.9 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in 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.

3.10 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.
1. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3.11 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 adjacent stone and nonmasonry 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.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.
 - 2. Grout.

- B. Related Sections:

- 1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Section 053100 "Steel Decking".
 - 3. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications not defined as structural steel.
 - 4. Section 055100 "Metal Stairs."
 - 5. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for surface-preparation and priming requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use LRFD; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Steel Moment Frames not specifically detailed for seismic resistance.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
 5. Identify demand critical welds.
 6. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer, fabricator, professional engineer and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Shop primers.
 3. Nonshrink grout.
- F. Source quality-control reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer with a minimum of five years of experience in erecting steel buildings similar in design and complexity to those indicated for this project. Installer shall submit qualifications for approval.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels and Angles: ASTM A 36/A 36M.
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
1. Weight Class: Standard unless noted otherwise.
 2. Finish: Black except where indicated to be galvanized.

- G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
1. Configuration: Straight.
 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 5. Finish: Plain.
- E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
1. Nuts: ASTM A 563 heavy-hex carbon steel.
 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 4. Finish: Plain.
- F. Threaded Rods: ASTM A 36/A 36M.
1. Nuts: ASTM A 563 heavy-hex carbon steel.
 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 3. Finish: Plain.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat. Do not prime steel that will receive spray fireproofing.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.

3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 4. Mark and match-mark materials for field assembly.
 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- F. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 4. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 SOURCE QUALITY CONTROL

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. The Fabricator shall be a designated AISC-Certified Plant, Category STD or the Fabricator at their expense shall engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports, this expense shall be added to the Non-Certified Fabricator's bid.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads.

Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base 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. Weld plate washers to top of baseplate, where indicated.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened unless otherwise indicated.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
 1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" Section 099123 "Interior Painting."

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. Joist accessories.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and professional engineer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/240 of the span.
 - 3. Design all roof joists for a net uplift of 30psf (ASD).
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- E. Camber joists according to SJI's "Specifications."
- F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 PRIMERS

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

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Welding Electrodes: Comply with AWS standards.
- F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
- C. Field weld joists to supporting steel framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Composite floor deck.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- D. Evaluation Reports: For steel deck.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

- C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ASC Profiles, Inc.; a Blue Scope Steel company.
 - 2. Canam United States; Canam Group Inc.
 - 3. CMC Joist & Deck.
 - 4. Consolidated Systems, Inc.; Metal Dek Group.
 - 5. Cordeck.
 - 6. DACS, Inc.
 - 7. Epic Metals Corporation.
 - 8. Marlyn Steel Decks, Inc.
 - 9. New Millennium Building Systems, LLC.
 - 10. Nucor Corp.; Vulcraft Group.
 - 11. Roof Deck, Inc.
 - 12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
 - 13. Verco Manufacturing Co.
 - 14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Deck Profile: Type WR, wide rib.
 - 3. Profile Depth: 1-1/2 inches.
 - 4. Design Uncoated-Steel Thickness: 0.0358 inches.
 - 5. Span Condition: Triple span or more.

6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ASC Profiles, Inc.; a Blue Scope Steel company.
 2. Canam United States; Canam Group Inc.
 3. CMC Joist & Deck.
 4. Consolidated Systems, Inc.; Metal Dek Group.
 5. Cordeck.
 6. DACS, Inc.
 7. Epic Metals Corporation.
 8. Marlyn Steel Decks, Inc.
 9. New Millennium Building Systems, LLC.
 10. Nucor Corp.; Vulcraft Group.
 11. Roof Deck, Inc.
 12. Verco Manufacturing Co.
 13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Profile Depth: 3 inches.
 3. Design Uncoated-Steel Thickness: 0.0358 inch.
 4. Span Condition: Triple span or more.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

- I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- J. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Provide Hilti X-HSN 24 pins at bar joist supports.
 - 2. Provide Hilti X-ENP 19 pins at structural steel supports, for steel 1/4-inch thick or greater.
 - 3. Fastener spacing: Within 8'-0" of perimeter fasten in a 36/7 pattern. Provide a 36/4 fastening pattern otherwise unless noted on plan.

- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, or as noted on plans and as follows:
 - 1. Mechanically fasten with self-drilling, Hilti S-SLC 01 or approved equal, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members with shear connector studs or by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 3/4 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart or as indicated on plans or brace sections. Note; a shear connector replaces the 3/4-inch puddle weld where installed.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.

- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Final Acceptance.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Soffit framing.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 inch.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- 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/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- F. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AllSteel & Gypsum Products, Inc.
2. California Expanded Metal Products Company.
3. ClarkWestern Building Systems, Inc.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Mfg., Inc.
6. Custom Stud Inc.
7. Design Shapes in Steel.
8. Dietrich Metal Framing; a Worthington Industries Company.
9. Formetal Co. Inc. (The).
10. MarinoWARE.
11. Nuconsteel; a Nucor Company.
12. Olmar Supply, Inc.
13. Quail Run Building Materials, Inc.
14. SCAFCO Corporation.
15. Southeastern Stud & Components, Inc.
16. State Building Products, Inc.
17. Steel Construction Systems.
18. Steel Network, Inc. (The).
19. Steel Structural Systems.
20. Steeler, Inc.
21. Super Stud Building Products, Inc.
22. Telling Industries, LLC.
23. United Metal Products, Inc.
24. United Steel Manufacturing.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 inch.
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

B. Cold-Formed Steel Framing Design Standards:

1. Wall Studs: AISI S211.

2. Headers: AISI S212.
 3. Lateral Design: AISI S213.
- C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
 2. Coating: G60.
- C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
 2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch.
 2. Minimum Flange Width: 1-5/8 inches.
 3. Section Properties: As required by design.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AllSteel & Gypsum Products, Inc.
 - b. ClarkWestern Building Systems, Inc.
 - c. Dietrich Metal Framing; a Worthington Industries company.
 - d. MarinoWARE.
 - e. SCAFCO Corporation.
 - f. Steel Network, Inc. (The).

g. Steeler, Inc.

D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0428 inch.
 - b. Flange Width: 1 inch plus the design gap of 3/4 inch.
2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0428 inch.
 - b. Flange Width: 2-3/4 inches.

2.5 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.
3. Section Properties: Minimum allowable calculated section modulus = 0.380 in³, moment of inertia = 0.697 in⁴, and allowable moment = 7502 in-lbs.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 2. Connect vertical deflection clips to infill studs and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Final Acceptance.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications 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 metal fabrications 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.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls.
 - 1. Select fasteners for type, grade, and class required.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring iron fabrications to other types of construction indicated and capable of withstanding design loads.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- F. Machine Screws: ASME B18.6.3.
- G. Plain Washers: Round, ASME B18.22.1.
- H. Lock Washers: Helical, spring type, ASME B18.21.1.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- C. Intermediate Coats and Topcoats: Provide products that comply with Division 09 painting Sections.
- D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.

- f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
- g. Tnemec Company, Inc.; Tneme-Zinc 90-97.

- E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Galvanize miscellaneous framing and supports.
- D. Prime miscellaneous framing and supports with zinc-rich primer.

2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.9 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Division 09 painting sections.
- D. 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) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Corrosion Protection: Coat concealed surfaces of metals that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 057313 - GLAZED DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior and exterior structural glass railings.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.

1.2 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor and exterior deck areas and for pedestrian guidance and support, visual separation, or wall protection.

1.3 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 items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Metal subrailings assembled from standard components.
2. Glass products.
3. Glazing cement and accessories for structural glass railings.
4. Sealant and accessories for structural glass railings.
5. Fasteners.
6. Wood rails and caps.
7. Shop primer.
8. Nonshrink, nonmetallic grout.
9. Anchoring cement.

- B. Shop Drawings: Include plans, elevations, sections, and attachment details.

- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

- D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Base channel.

3. Each type of glass and glass edge required.
 4. Fittings and brackets.
 5. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, glass panels. Show method of finishing members at intersections. Samples need not be full height.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a qualified professional structural engineer, licensed in the State of North Carolina, responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.
- C. Product Test Reports: For tests performed by a qualified testing agency, in accordance with ASTM E894, ASTM E935, ASTM E2353, and ASTM E2358.
- D. Evaluation Reports: From ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
1. For glazed decorative metal railings.
 2. For post-installed anchors.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build mockups for each form and finish of glass-infill panel railing consisting of two posts, top rail, handrail, glass-infill panel, and anchorage system components that are full height and are not less than 24 inches in length.
 2. Build mockups for each form and finish of structural glass railing consisting of top rail, structural glass, base channel, and anchorage system components that are full height and are not less than 24 inches in length.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

1.8 FIELD 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.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Glass: Glazed decorative metal railing manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Blum, Julius & Co., Inc.
 2. C.R. Laurence
 3. HDI Railing Systems
 4. Hollaender Architectural Railing Systems
 5. Livers Bronze Co.
 6. P & P Artec
 7. VIVA Railings, LLC.
- B. Source Limitations for Laminated Glass: Obtain from single source from single manufacturer.
- C. Source Limitations for Decorative Metal Railing Components: Obtain from single source from single manufacturer for each component and installation method.
- D. Product Options: Information on Drawings and in the Specifications establishes requirements for railing system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 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.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional structural engineer, as defined in Section 014000 "Quality Requirements," to design glazed decorative metal railings to comply with structural performance requirements, including attachment to building construction. Engineer shall be licensed in the State of North Carolina.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 1. Stainless Steel: 60 percent of minimum yield strength.
 2. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA CW-12, "Structural Properties of Glass."
- C. Structural Performance: Railings, 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. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Structural Glass Railings:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.

3. Structural Glass Railings: Support each section of top rail and handrail by a minimum of three glass panels or by other means so railings will remain in place if any one glass panel fails.
 - a. Support top rail and handrail ends such that railings remains in place if end glass panel fails.
- D. Wind Loads: For exterior glazed decorative metal railings, capable of withstanding the following wind loads in accordance with the IBC and ASTM E1300:
 1. Wind Load: As indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- 2.3 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: Same metal and finish as supported rails unless otherwise indicated.
- 2.4 STAINLESS STEEL
 - A. Tubing: ASTM A554, Grade MT 304.
 - B. Pipe: ASTM A312/A312M, Grade TP 304.
 - C. Castings: ASTM A743/A743M, Grade CF 8 or Grade CF 20.
 - D. Sheet, Strip, Plate, and Flat Bar: ASTM A666 or ASTM A240/A240M, Type 304.
 - E. Bars and Shapes: ASTM A276, Type 304.
- 2.5 GLASS AND GLAZING PRODUCTS, GENERAL
 - A. Glazing Publications: Comply with written instructions of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. NGA/GANA Publications: "GANA Laminated Glazing Reference Manual" and "GANA Glazing Manual."
 - B. Safety Glazing: Glazing shall comply with 16 CFR 1201, Category II.
 - C. Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 1. Safety glazing labels must be visible after final installation. Labels obscured by railing components will be rejected and shall be replaced at Contractor's expense.
 - D. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Class 1 and low-iron clear, or Class 2 (tinted) as indicated, Quality-Q3.

- E. Glazing Cement and Accessories for Structural Glass Railings: Glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal base channels.
- F. Sealant and Accessories for Structural Glass Railings: Sealant, gaskets, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal base channels.

2.6 GLASS HANDRAILS AND GUARDS

- A. Laminated Glass Handrails and Guards: ASTM C1172, Type II with two plies of clear glass bonded together by a clear interlayer.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer or ionoplast polymer interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: 0.060 inch or as required by structural loads and to match existing.
 - 3. Kind: LT (laminated tempered).
 - 4. Glass Plies for Panels: Thickness required by structural loads, but not less than 6.0 mm each.

2.7 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Stainless Steel Components: Type 304 stainless steel fasteners.
 - 2. Dissimilar Metals: Type 304 stainless steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.
 - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/ASTM F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts; ASTM F594.

2.8 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast stainless steel, center of rail 3-1/8 inches from face of structural glass.
- B. Interior Wood Rails and Caps: Clear, straight-grained hardwood rails secured to recessed metal subrail.
 - 1. Species: Select White Maple.
 - 2. Finish: Manufacturer's standard transparent polyurethane.
 - 3. Staining: Match Architect's sample.
 - 4. Profile: As indicated on Drawings.

- C. Exterior Wood Rails and Caps: Clear, straight-grained hardwood rails secured to recessed metal subrail.
 - 1. Species: Teak.
 - 2. Profile: As indicated on Drawings.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. 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.
 - 1. Water-Resistant Anchoring Cement: where indicated 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.

2.9 FABRICATION OF GLASS PANELS

- A. Fabricate glass to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
- B. Glass-Infill Panels: Provide laminated, tempered glass-infill panels for both straight and curved sections.
 - 1. Edge Finish: Clean-cut or flat-grind edges to produce smooth, square edges with slight chamfers at junctions of edges and faces. (Match existing)

2.10 METAL FINISH REQUIREMENTS, GENERAL

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.11 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Tubing Finishes:
 - 1. 180-Grit Polished Finish: Uniform, directionally textured finish.
- D. Stainless Steel Sheet, Strip, Plate, and Bar Finishes:

1. Directional Satin Finish: ASTM A480/A480M, No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with Drawings and manufacturer's written instructions for installing glazed decorative metal railings, accessories, and other components.
- B. Perform cutting, drilling, and fitting required for installing metal railings.
 1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. Do not weld, cut, or abrade surfaces of metal 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.
 5. 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.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 METAL RAILING CONNECTIONS

- A. Nonwelded Connections:
 1. Use mechanical or adhesive joints for permanently connecting railing components.
 2. Use wood blocks and padding to prevent damage to railing members and fittings.
 3. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Expansion Joints: Install expansion joints at locations indicated, but not farther apart than required to accommodate thermal movement.

3.3 INSTALLATION OF GLASS

- A. Structural Glass Railings:
 1. Install assembly to comply with railing manufacturer's written instructions.
 2. For field-assembled panels, attach base channel to building structure, insert glass in base channel, and bond with glazing cement.
 - a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement.
 - b. Fill remaining space in base channel with glazing cement for uniform support of glass.
 3. Adjust spacing of glass so gaps between panels are equal before securing in position.
 4. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.

5. Ensure safety glazing labels are visible. Remove and replace glazing panels if safety glazing labels are obscured by railing components.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings in accordance with ASTM E894, ASTM E935, ASTM E2353, and ASTM E2358 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING

- A. Clean stainless steel by washing thoroughly with water and soap, rinsing with clean water, and wiping dry.
- B. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Final Acceptance.
- C. Clean wood rails by wiping with a damp cloth and then wiping dry.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Final Acceptance.
- B. 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 057313

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.

1.2 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 used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.

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.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed 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 A U1; Use Category UC2 for interior construction not in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. Use Categories:

- a. AWP A U1-UC2 for interior construction not in contact with ground.
 - b. AWP A U1-UC3A: Exterior, coated not in contact with ground, such as coated millwork, siding, trim.
 - c. AWP A U1-UC4A: Exterior, in contact with ground normal, such as fence/deck posts.
 - d. AWP A U1-UC5B: Exposed to salt water between NJ and Georgia/south of San Francisco
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
- 1. Blocking.
 - 2. Nailers.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
- 1. Mixed southern pine, No. 2 grade; SPIB.
 - 2. Eastern softwoods, No. 2 Common grade; NELMA.
 - 3. Northern species, No. 2 Common grade; NLGA.
 - 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWP A.
- D. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 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 of Type 304 stainless steel.
- B. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit.
- B. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for 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.
 - 1. Do not use wood blocking in fire-resistance-rated assemblies.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.

B. Related Requirements:

1. Section 072500 "Weather Barriers" for building wrap and flexible flashings at openings in sheathing.

1.2 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-preserved 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.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.4 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 WOOD PANEL PRODUCTS

A. Oriented Strand Board: DOC PS 2.

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

- A. Oriented-Strand-Board Sheathing: Exposure 1 sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 1/2 inch.

2.4 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 A 153/A 153M.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

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.
 - 2. ICC-ES evaluation report for fastener.
- 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 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior upholstered seating cubbies.

B. Related Sections:

1. Section 057313 "Glazed Decorative Metal Railings" for wood handrails and caps.

1.2 ACTION SUBMITTALS

A. Product Data: For panel products and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

C. Samples for Verification:

1. Fabric upholstery.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.5 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWS quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood 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 nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Complete fabrication 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.

2.4 UPHOLSTERED SEATING

- A. Seating Cubbies:
 - 1. Grade: Custom.
 - 2. Hardwood Veneer Plywood: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.
 - a. Wood Species: Any closed grain hardwood.
 - b. Thickness: 3/4-inch.
 - 3. Profile and Dimensions: As indicated on Drawings.
 - 4. Finish: Painted finish.
- B. Cushion: Upholstered padded cushion.
 - 1. Fabric (**UPH-1**): Seat and back fabric.
 - a. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:

- 1) HBF Textiles; Captain Bubble 999, Color 67 Tranquil (Basis of Design)
 - 2) Designtex
 - 3) Wolf Gordon
2. Padding: High-density polyurethane foam, minimum 2-inches thick.

2.5 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Preparation 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.
1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats. Apply two coats to back of paneling and to end-grain surfaces.
- D. Opaque Finish:
1. Architectural Woodworking Standards Grade: Custom.
 2. Finish: System - 11, Polyurethane, Catalyzed.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter according to ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

- F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semiexposed surfaces.

END OF SECTION 064023

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

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

1.3 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 1. Henry Company; HE785 Asphalt Emulsion Damp Proofing (Basis of Design)
 2. BASF Corporation
 3. Euclid Chemical Company
 4. W.R. Meadows
- B. Trowel Coats: ASTM D1227, Type II, Class 1.
- C. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.4 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D1668/D1668M, Type I.
- D. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- E. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C578, Type X, 1/2 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.
- B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing planter footings and walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Masonry Planter Walls: Apply one trowel coat at not less than 4 gal./100 sq. ft.

3.5 PROTECTION COURSE INSTALLATION

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.

3.6 PROTECTION

- A. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where panels are subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION 071113

SECTION 071413 - FLUID-APPLIED WATERPROOFING AND DECK PAVER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rubberized-asphalt waterproofing membrane, unreinforced.
2. Molded-sheet drainage panels.
3. Insulation.
4. Plaza deck pavers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
 1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- C. Samples: For the following products in manufacturer's standard sizes unless otherwise indicated:
 1. Plaza deck paver, full sized in each color and texture required.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificate: Signed by manufacturer certifying that installer complies with requirements.
- C. Product Test Reports: For waterproofing, based on evaluation of comprehensive tests performed by a qualified testing agency.
- D. Field quality-control reports.
- E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is acceptable to manufacturer for installation of waterproofing required for this Project and is eligible to receive special warranties specified.
 1. Installer shall have not less than five waterproofing projects similar to requirements for this Project with satisfactory in-service performance and which is acceptable to waterproofing manufacturer.
- B. Source Limitations: Obtain waterproofing materials from single source from single manufacturer. Provide auxiliary materials as recommended by waterproofing manufacturer.

- C. Mockups: Install waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. Install pavers and paver supports to demonstrate aesthetic affects and set quality standards for materials and execution.
 - 1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlaying construction 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. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's project specific form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.
 - 1. Warranty insulation will retain 80 percent of original published thermal value.
 - 2. Warranty pavers will not dish or warp and will not crack, split, or disintegrate in freeze-thaw conditions.
 - 3. Warranty includes repairing or replacing waterproofing and removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.
 - 4. Warranty Period: 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS, GENERAL

- A. Provide waterproofing materials recommended by manufacturer to be compatible with one another and capable of bonding to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.
- B. Provide waterproofing materials suitable for application to vertical, horizontal, and sloped substrates, as applicable.

2.2 WATERPROOFING MEMBRANE

- A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. American Hydrotech, Inc.; Monolithic Membrane 6125EV (Basis of Design)
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. Henry Company
 - d. Tremco Incorporated
 - 2. Thickness: Nominal 215-mil, fabric reinforced.

2.3 FLASHING SHEET MATERIALS

- A. Elastomeric Flashing Sheet: 50-mil minimum, uncured sheet neoprene as follows:
 - 1. Tensile Strength: 1400 psi minimum; ASTM D 412, Die C.
 - 2. Elongation: 300 percent minimum; ASTM D 412.
 - 3. Tear Resistance: 125 psi minimum; ASTM D 624, Die C.
 - 4. Brittleness: Does not break at minus 30 deg F; ASTM D 2137.

2.4 AUXILIARY MATERIALS

- A. Primer: ASTM D 41, asphaltic primer.
- B. Reinforcing Fabric: Spunbonded polyester fabric reinforcing sheet.
- C. Elastomeric Sheet: 50-mil minimum, uncured sheet neoprene, with same performance properties as elastomeric flashing sheet.
- D. Metal Termination Bars: Predrilled stainless-steel termination bars; approximately 1 by 1/8 inch thick; with anchors.
- E. Sealants and Accessories: Manufacturer's recommended sealants and accessories.
- F. Protection Course: Manufacturer's standard, 80- to 90-mil thick, fiberglass-reinforced rubberized asphalt or modified bituminous sheet.

2.5 MOLDED-SHEET DRAINAGE PANELS

- A. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve, laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm/ft.

2.6 INSULATION

- A. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company; Plazamate (Basis of Design)
 - c. Owens Corning.
 2. Type VI, 60-psi minimum compressive strength.

2.7 PLAZA DECK PAVERS

- A. Plaza Deck Pavers: Heavyweight, hydraulically pressed, concrete units, with top edges beveled 3/16 inch, manufactured for use as plaza deck pavers; minimum compressive strength 7500 psi, ASTM C 140; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hanover Architectural Products.
 - b. Stepstone, Inc.
 - c. Wausau Tile, Inc.; Terra-Paving Division.
 - d. Westile Roofing Products.
 2. Thickness: 2 inches.
 3. Face Size: 12 by 12 inches.
 4. Color: As selected by Architect from manufacturer's full range.
- B. Paver Supports: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
 - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

- A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
 - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
 - 2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
 - 3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8 inch thick, and beyond roof drains and penetrations.
 - a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.
- B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 inches on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 FLASHING INSTALLATION

- A. Install elastomeric flashing sheets at terminations of waterproofing membrane according to manufacturer's written instructions.
- B. Prime substrate with asphalt primer.
- C. Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.
- D. Extend elastomeric flashing sheet up walls or parapets a minimum of 8 inches above plaza deck pavers and 6 inches onto deck to be waterproofed.

- E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of roofing.

3.5 MEMBRANE APPLICATION

- A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
- B. Heat and apply rubberized asphalt according to manufacturer's written instructions.
 - 1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.
- C. Start application with manufacturer's authorized representative present.
- D. Membrane Application: Apply the rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 90 mil minimum, into which is fully embedded a layer of the spunbonded polyester fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at an average thickness of 125 mil. Total membrane thickness shall be 215 mils average, 180 mils minimum.
- E. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
- F. Cover waterproofing with protection course with overlapped joints.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. For vertical applications, install board insulation before installing drainage panels.

3.7 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
- B. On vertical surfaces, set insulation units into rubberized asphalt according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 PLAZA DECK PAVER INSTALLATION

- A. Install concrete pavers in locations indicated according to manufacturer's written instructions.
- B. Accurately install adjustable-height paver pedestals and accessories in locations and to elevations required. Adjust for final level and slope with shims.
 - 1. If required by manufacturer, fill paver pedestal with concrete mix, strike smooth with top of pedestal, and cure according to ACI 301.

- C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.
 - 1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.
 - 2. Provide oversized pavers with scored joints to minimize or eliminate small cut pieces.
- D. Install pavers to not vary more than 1/16 inch in elevation between adjacent pavers or more than 1/16 inch from surface plane elevation of individual paver.
- E. Maintain tolerances of paving installation within 1/4 inch in 10 feet of surface plane in any direction.

3.9 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of the membrane, flashings, protection, and drainage components; furnish daily reports to Architect.
- B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
 - 2. Flood each area for 48 hours.
 - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
- C. Owner will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.10 CLEANING AND PROTECTION

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071413

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wrap.
2. Flexible flashing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

B. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Obdyke; FlatWrap HP
 - b. DuPont Building Innovations; Tyvek Commercial Wrap
 - c. Fortifiber Building Systems Group; WeatherSmart Commercial
 - d. Kingspan Insulation LLC; HPW Building Wrap
 - e. Polymer Group, Inc.; Typar Metrowrap
 - f. Raven Industries, Inc.; Fortress Pro Weather Protective Barrier
2. Water-Vapor Permeance: Not less than 10 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
4. Allowable UV Exposure Time: Not less than three months.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

A. Opening/Penetration Flashing: Building wrap manufacturer's recommended system.

B. Window/Door (Rubberized-Asphalt) Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GCP Applied Technologies; Vycor V40 Weather Barrier Strips
 - b. MFM Building Products Corp.; Window Wrap
 - c. Polyguard Products, Inc.; Polyguard 300
 - d. Protecto Wrap Company; PW100/40
- C. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.
- D. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
 1. Seal seams, edges, fasteners, and penetrations with tape.
 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over water-resistive barrier at head, bottom and sides of openings in accordance with manufacturer's written instructions.
 4. Apply flashing to perimeter frame surfaces of windows, storefronts, doors, and miscellaneous penetrations.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fiber-cement siding and soffits.

1.2 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For fiber-cement siding including related accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Build mockups for fiber-cement siding including accessories.
 - a. Size: 48 inches long by 60 inches high.
 - b. Include outside corner on one end of mockup and inside corner on other end.
 - 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 Final Acceptance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Warranty Period: 25 years from date of Final Acceptance.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allura; a Plycem company
 - 2. CertainTeed Corporation
 - 3. GAF
 - 4. James Hardie Building Products, Inc.
 - 5. Maxitile
 - 6. Nichiha Fiber Cement

2.2 FIBER-CEMENT SIDING

- A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E136; with a flame-spread index of 25 or less when tested according to ASTM E84.
- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
- D. Panels: 48-inch- wide sheets with smooth texture.
- E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
- B. Texture: Smooth.

- C. Width: As indicated on Drawings.
- D. Ventilation: Non-perforated.
- E. Factory Priming: Manufacturer's standard acrylic primer.

2.4 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim."
 - 1. Finish for Aluminum Flashing: High-performance organic finish.
- C. Fasteners: As recommended by manufacturer and tested and approved for project wind zone.
 - 1. Provide fastener types and sizes as required for each wall assembly in accordance with test report ICC ESR-2290.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Do not install damaged components.
 - 2. Comply with manufacturer's recommended fastening pattern.
 - a. Where a specified level of wind resistance is required, install siding to framing members and secure with fasteners in accordance with manufacturers tested assembly and approved Shop Drawings.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
2. Roof insulation.
3. Cover board.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness if insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane and fastening spacings and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

7. Tie-in with air and weather barrier.
8. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
9. Indicate roof design of fasteners and specifications to meet wind force loads.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit name and qualification data for qualified roofing Installer and membrane manufacturer, indicating full compliance with specification requirements. Architect and Owner reserve the right to reject roof Installer and/or membrane manufacturer if documentation of full compliance with specifications is not provided.

1. Submit certificate from manufacturer certifying that Installer has been trained by the manufacturer and is an authorized/certified installer of the specific roof membrane proposed for this Project.
2. The Installer through the Contractor shall submit references, stating satisfactory performance of installation, from five different Architects or Owners for projects that the Installer has completed and have been in service for a minimum of two years. Include complete contact information, also completion date, size and location of project.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of complying with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports: Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Inspection Report: Copy of roofing system manufacturer's inspection report with written approval as to specification compliance and acceptance of completed roofing system installation.

G. Field quality-control reports.

H. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
 - 1. The installer shall demonstrate and offer written attested certification that he has installed; a minimum of 500 squares (50,000 sq. ft.) per year for each of the past three years, of the material that he is bidding.
 - a. Installation of other types of membranes, or another manufacturer's goods is not considered as meeting the above requirement.
 - b. Installer shall have been in business under its present name for at least 5 years prior to start of this project.
 - 2. The installer shall substantiate a track record of the manufacturer's working with the installer, for three consecutive years, and at a scale of operations cited above.
 - 3. The Crew Chief/Foreman, shall be physically on-site, directly supervising the Work, during the entire period of installation of roof membrane.
 - a. Crew Chief/Forman shall be trained and certified by the roofing system manufacturer and shall have on their person an identification card, certifying completion of training and approval of the manufacturer for the roofing system being installed. The installer shall have been actively installing the type of roofing system defined in these specifications for a minimum of 3 years.
 - b. Quality Incident Rate: Less than 5.0.
- C. Roofing Inspections: Make required notifications, secure required inspections and pay fees such that the specified systems warranty are assured at the time of completion of the Work.
 - 1. Contractor and Manufacturer's assigned representative shall inspect and warrant the Work as a condition of acceptance.
 - 2. Manufacturer shall provide project start-up guidance and direction at start of installation and then provide inspections by manufacturer's technical inspector at 25 percent, 50 percent and final, with inspection reports submitted to the Roofing Installer, General Contractor and Architect/Owner. Deficiencies shall be listed on the inspection reports and all repairs/corrections made and certified completed and approved by the inspector submitted with next and final report.
 - 3. Manufacturer's Final Completion/Warranty Inspection: Upon completion of the Work and prior to final payment, the roofing manufacturer's representative, in the presence of the Owner and Architect, shall inspect the roofing Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his certification/approval of the Work and close-out submittals, including Roofing Warranties and roof maintenance instructions, have been received by the Architect. Warranties issued prior to final inspection are not acceptable and shall not qualify for release of final payment for roofing work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, roofing accessories, manufacturer's edge metal products and other components of roofing system.
 - 2. Provide manufacturer's standard wind warranty, not less than 60 mph.
 - 3. Warranty Period: 20 years from Date of Final Acceptance.
 - 4. System Warranty: As a part of the work of this Section, pay all required fees, secure all required inspections, and do all things necessary to secure and deliver to the owner a 20-year Total System Warranty from the manufacturer of the approved materials. The bond shall provide no dollar limit (NDL) liability when all published conditions are met.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, and cover boards, for the following warranty period:
 - 1. Warranty Period: Five years from date of Final Acceptance.
- C. Warranty Plaque: The Contractor shall provide a roof warranty plaque, to the contractor for mounting on the wall beside the roof access ladder/hatch. The plaque shall have a warning stating the following:
- D. "Prior to making modifications or repairs to the existing roof, approval for modifications and repairs from the manufacturer, must be obtained. All work on existing warranted roofing system shall be performed so as to maintain warranties, work that would void warranties is prohibited. Entities performing work that would void existing roof warranties shall be liable for cost to make necessary repairs, required to reinstate warranties."
 - 1. The plaque shall also contain the name of the manufacturer, serial number of warranty, date of issue of the warranty, length of warranty and names and telephone numbers of manufacturer contacts. Include a copy of the warranty. The plaque shall be covered/protected by a clear acrylic/polycarbonate sheet screwed or otherwise attached to substrate of plaque, which shall be sealed wood, plastic or non-corrosive metal. Provide one at each access ladder/hatch.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the Resistance to Foot Traffic Test in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Roofing System Design: Design roofing system to comply with design criteria of the North Carolina Building Code.
 - 1. Wind Uplift Pressures: As indicated on Structural Drawings.
- D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4474 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail-Resistance Rating: MH.
- E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

- A. EPDM Sheet: ASTM D 4637/D 4637M, Type I, nonreinforced, fleece backed EPDM sheet.
 - 1. Thickness: 60 mils, nominal.
 - 2. Exposed Face Color: White.
 - 3. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: 90-mil-thick EPDM, partially cured or cured, according to application.

- C. Protection Sheet: Epichlorohydrin or neoprene nonreinforced flexible sheet, 55 to 60 mils thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
- D. Slip Sheet: Manufacturer's standard, of thickness required for application.
- E. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- F. Bonding Adhesive: Manufacturer's standard.
- G. Membrane Adhesive: Provide one of the following as recommended by manufacturer.
 - 1. Modified Asphaltic Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard modified asphalt, asbestos-free, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.
 - 2. Water-Based, Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard water-based, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.
 - 3. Low-Rise, Urethane, Fabric-Backed Membrane Adhesive: Roof system manufacturer's standard spray-applied, low-rise, two-component urethane adhesive formulated for compatibility and use with fabric-backed membrane roofing.
- H. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3-inch-wide minimum, butyl splice tape with release film.
- I. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- J. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- K. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- L. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- M. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.
- N. Miscellaneous Accessories: Provide pourable sealers, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.
 - 1. Provide white flashing accessories for white EPDM membrane roofing.
- O. Liquid Coating: Product specifically formulated for coating EPDM membrane roofing, as follows:
 - 1. Type: Acrylic emulsion complying with ASTM D 6083.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM roof membrane manufacturer.

- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Roofing Corporation.
 - b. Carlisle SynTec Incorporated.
 - c. Firestone Building Products.
 - d. GAF.
 - e. Hunter Panels.
 - f. Johns Manville; a Berkshire Hathaway company.
 - g. Rmax, Inc.
 2. Compressive Strength: 25 psi.
 3. Thickness: As indicated on Drawings, or as required to achieve R-value indicated on Drawings.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
1. Material: Match roof insulation.
 2. Minimum Thickness: 1/4 inch.
 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
1. Modified asphaltic, asbestos-free, cold-applied adhesive.
 2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
 3. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
- D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc Roof Board
 - b. Georgia-Pacific Gypsum LLC; DensDeck Prime
 - c. National Gypsum Company; DEXcell FA Glass Mat Roof Board
 - d. United States Gypsum Company; Securock Glass-Mat Roof Board
 - e. Roofing membrane manufacturer's tested, approved, and warranted cover board that is equivalent to specified product.
 2. Thickness: 1/2 inch.
 3. Surface Finish: Factory primed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier and weather barrier.

3.4 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 - 1. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.
 - a. Locate end joints over crests of decking.
 - b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

- c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation units over substrate.
 - i. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - f. Trim insulation so that water flow is unrestricted.
 - g. Fill gaps exceeding 1/4 inch with insulation.
 - h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - i. Loosely lay each layer of insulation units over substrate.
 - j. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
 - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - 2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
- 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 4. Loosely lay cover board over substrate.

5. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
 - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

- B. Install slip sheet over cover board and immediately beneath roofing.

3.6 ADHERED ROOFING INSTALLATION

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll membrane roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement.
 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 2. Apply lap sealant and seal exposed edges of roofing terminations.
 3. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.
- J. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape.
 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 2. Apply lap sealant and seal exposed edges of roofing terminations.
 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- K. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.
- L. Adhere protection sheet over roof membrane at locations indicated.

3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 COATING INSTALLATION

- A. Apply coatings to roof membrane and base flashings according to manufacturer's written recommendations, by spray, roller, or other suitable application method.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Upon completion of the Work and prior to final payment, the membrane manufacturer's representative, in the presence of the Owner and Architect, shall inspect Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his approval for Work and closeout submittals, including roof maintenance manual and warranties, have been received by the Architect.
 - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.
- C. Verify field strength of seams a minimum of twice daily, according to manufacturer's written instructions, and repair seam sample areas.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Final Acceptance and according to warranty requirements.

- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <Insert name of Owner>.
 2. Address: <Insert address>.
 3. Building Name/Type: <Insert information>.
 4. Address: <Insert address>.
 5. Area of Work: <Insert information>.
 6. Acceptance Date: _____.
 7. Warranty Period: <Insert time>.
 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding <Insert mph>;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075323

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formed low-slope sheet metal fabrications.
 - 2. Formed wall sheet metal fabrications.

1.2 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 manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of special conditions.
 - 6. Details of connections to adjoining work.
 - 7. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Verification: For each type of exposed finish.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Sample Warranty: For special warranty.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- 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. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.
- C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. 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 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. Finish Warranty Period: 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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 degrees F, ambient; 180 degrees F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
1. Exposed Coil-Coated Finish: Two-Coat Fluoropolymer: AAMA 2605. 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.
 2. Color: As selected by Architect from manufacturer's full range.
 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Atlas Roofing Corporation; WeatherMaster PolySeal.
 - b. Carlisle Coatings & Waterproofing Inc.; WIP 300HT.
 - c. CertainTeed Corporation; WinterGuard HT.
 - d. Drexel Metals Inc.; MetShield.
 - e. GAF Materials Corporation; Roof Pro.
 - f. GCP Applied Technologies; Grace Ice and Water Shield HT.
 - g. Henry Company; Blueskin PE200 HT.
 - h. InterWrap Inc.; Titanium PSU-30.
 - i. Kirsch Building Products, LLC; SharkSkin Ultra SA.
 - j. MFM Building Products Corp.; Ultra HT Wind and Water Seal.
 - k. Owens Corning; WeatherLock Specialty Tile & Metal.
 - l. Polyguard Products, Inc.; Deck Guard HT.
 - m. SPD Advanced Polymer Products, Inc.; Palisade-SA-HT.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 3. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degrees F.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true in line and levels indicated, with exposed edges folded back to form hems.

- E. Seams: Fabricate nonmoving seams with flat-lock seams.
 - 1. Tin edges to be seamed, form seams, and solder.
 - 2. Coated Metals: Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 - 3. Uncoated Aluminum: Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
 - 4. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual".
- I. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof-Penetration Flashing: Roofing membrane manufacturer's approved system.
- B. Roof-Drain Flashing: Roofing membrane manufacturer's approved system.

2.7 WALL SHEET METAL FABRICATIONS

- A. Metal Flashing: Fabricate from aluminum, 0.040 inch thick.
- B. Base Flashing: For flashing not exposed to the exterior, use one of the following:
 - 1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry. Subject to compliance with requirements, provide one of the following products:
 - a. Advanced Building Products Inc.; Copper Fabric Flashing
 - b. AFCO Products Inc.; Copper Fabric
 - c. Hohmann & Barnard, Inc.; H & B C-Fab Flashing
 - d. Phoenix Building Products; Type FCC-Fabric Covered Copper
 - e. Polyte Manufacturing Corp.; Copper Fabric Flashing
 - f. Sandell Manufacturing Co., Inc.; Copper Fabric Flashing
 - g. York Manufacturing, Inc.; York Copper Fabric Flashing
 - 2. Laminated Stainless Steel Fabric Flashing, Non-Asphaltic: Stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive. Provide with manufacturer recommended accessory items for a complete compatible system. Subject to compliance with requirements, provide one of the following:
 - a. Hohman and Bernard, Inc.; Mighty-Flash Stainless Steel Fabric Flashing.
 - b. York Manufacturing, Inc.; Multi-Flash SS
 - c. STS Coatings, Inc.; Gorilla Flash Stainless Fabric
 - d. Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing

- e. TK Products, Inc.; TK TWF
- 3. Self-Adhering Stainless Steel Flashing: 2 mil., Type 304 stainless steel with butyl rubber adhesive on one face. Use where flashing is fully concealed in masonry. Subject to compliance with requirements, provide one of the following:
 - a. Hohman and Bernard, Inc.; Mighty-Flash SA.
 - b. York Manufacturing, Inc.; York 304 SS.
 - c. Illinois Products, Inc.; IPCO Self-adhering Stainless Steel Fabric Flashing
 - d. Vapro Shield, Inc.; Vapro SS Flashing
- 4. Termination Bar: Stainless steel.
- C. Opening Flashings in Frame Construction: Refer to Section 072500 "Weather Barriers" for flexible flashings.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Pipe Penetrations: Premolded rubber or roof membrane manufacturer's recommended elastomeric type.
 - 1. Provide stainless steel clamp ring, sealant, and fasteners as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to provide a complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
1. Aluminum: Use aluminum or stainless-steel fasteners.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.
- 3.4 ROOF FLASHING INSTALLATION
- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install flexible flashings in accordance with Section 072500 "Weather Barriers."

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Pipe Penetration Flashing: Install in accordance with roofing membrane manufacturer's written instructions.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Copings.
 - 2. Reglets and counterflashings.

1.2 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 roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
 - 1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 3. Details of termination points and assemblies, including fixed points.
 - 4. Details of special conditions.
- C. Samples: For each type of roof specialty indicated with factory-applied color finishes.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.
- B. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. 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 roof edge, approximately 10 feet long, including supporting construction, seams, attachments, and accessories.
 - 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. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.
- B. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
 - 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 3. Review special roof details and condition of other construction that will affect roof specialties.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with copings and roof-edge flashings by field measurements before fabrication.

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter 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. Finish Warranty Period: 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Except as otherwise shown on Drawings or specified, the workmanship of sheet metal work, method for forming joints, anchoring, cleating and provisions for expansion shall conform to the standard details and recommendations of the Copper and Brass Research Association; and workmanship shall be of the best quality, in accordance with best trade practice and the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc.
- C. FM Approvals' Listing: Manufacture and install copings and roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120. Identify materials with FM Approvals' markings.
- D. SPRI Wind Design Standard: Manufacture and install copings and roof-edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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 thermal movements. 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, ambient; 180 deg F, material surfaces.

2.2 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
 - 1. Surface: Smooth, flat finish.

2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.3 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.
 1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. ATAS International, Inc.
 - b. Hickman Company, W. P.
 - c. Merchant & Evans, Inc.
 - d. Metal-Era, Inc.
 - e. Metal Roofing Systems
 - f. MM Systems Corporation
 - g. Petersen Aluminum Corporation
 2. Coping-Cap Material: Formed aluminum, 0.050 inch thick; or thickness as required to meet performance requirements.
 3. Corners: Factory mitered and continuously welded.

4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
 - a. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
 - b. Face Leg Cleats: Concealed, continuous galvanized-steel sheet.
5. Color: Color as selected by Architect from manufacturer's full range.

2.6 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Fry Reglet Corporation.
 2. Hickman Company, W. P.
 3. Metal-Era, Inc.
 4. MM Systems Corporation.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
 1. Material: Aluminum, 0.040 inch thick.
 2. Corners: Factory mitered and continuously welded.
 3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
 5. Color: As selected by Architect from manufacturer's full range.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
 1. Formed Aluminum: 0.040 inch thick.
 2. Color: As selected by Architect from manufacturer's full range.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer and as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. 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.

3.3 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to meet performance requirements.
 - 1. Interlock face leg and back leg drip edges on snap-on coping cap into cleated anchored plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.4 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- C. Embedded Reglets: See Section 040200 "Unit Masonry" for installation of reglets.
- D. Counterflashings: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashings into reglets or other indicated receivers and fit tightly to base flashing. Extend counterflashings 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077129 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded bellows roof expansion joints.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roof expansion joints.

1. Include plans, elevations, sections, and attachment details.
2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
3. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

C. Samples: For each exposed product and for each color specified, 6 inches in size.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer of roofing membrane.

B. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- C. Fire-Test-Response Characteristics: Provide fire-barrier assemblies with fire-test-response characteristics as determined by testing identical products, per test method indicated, by UL or another testing agency acceptable to authorities having jurisdiction. Assemblies shall be capable of anticipated movement while maintaining fire rating. Fire-barrier products shall bear classification marking of qualified testing agency.
 - 1. Fire-Resistance Rating: Not less than fire-resistance rating of the roof assembly.

2.2 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated below or comparable product by one of the following:
 - 1. Balco, Inc. (Basis of Design)
 - 2. Construction Specialties
 - 3. InPro Corporation
 - 4. MM Systems Corporation
 - 5. Watson Bowman Acme Corp.

2.3 EXTRUDED BELLOWS ROOF EXPANSION JOINTS

- A. Extruded Bellows Roof Expansion Joint: Manufactured, continuous, waterproof, joint cover assembly; consisting of primary and secondary, single-layered, elastomeric seals; secured along each edge with extruded-aluminum retainers for fastening to substrate.
 - 1. Roof-to-Wall Basis of Design: Balco; RW-2
 - 2. Joint Movement Capability: Plus and minus 50 percent of joint size.
 - 3. Primary Seal: Silicone extrusion; color: White.
 - 4. Secondary Seal: EPDM, or manufacturer's standard elastomeric seal.
 - 5. Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.
- B. Materials:
 - 1. Aluminum: ASTM B221 for extrusions; mill finish, with temper to suit forming operations and performance required.
 - a. Apply manufacturer's standard protective coating on aluminum surfaces in contact with cementitious or preservative-treated wood materials.
 - 2. Silicone Extrusions: ASTM D2000, UV stabilized, and that does not propagate flame.
 - 3. EPDM Membrane: ASTM D4637, type standard with manufacturer for application.

- C. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
 - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
 - 2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 3. Provide for linear thermal expansion of roof expansion joint materials.
 - 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
 - 5. Provide uniform, neat seams.
 - 6. Install roof expansion joints to fit substrates and to result in watertight performance.
 - 7. Torch cutting of roof expansion joints is not permitted.
- B. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install factory-fabricated units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Section 079500 "Expansion Control" to provide continuous, uninterrupted, and watertight joints.
- C. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
 - 1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- D. Fire Barrier: Install fire barrier where indicated to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.
- E. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

END OF SECTION 077129

SECTION 078100 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sprayed fire-resistive materials (SFRM).

B. Special Notice:

1. Unless specifically noted otherwise, the steel structure shall be considered "unrestrained" in accordance with the fire exposure and acceptance criteria specified in ASTM E 119 for the purpose of determining the thickness of spray-applied fireproofing.
2. Calculation Requirements:
 - a. For steel beams complying with UL Designs indicated on Drawings and W/D values required by North Carolina Building Code, Contractor shall provide fireproofing thickness as required by UL Design.
 - b. For steel beams not complying with UL Design indicated on Drawings and W/D values required by North Carolina Building Code, Contractor is responsible to have the W/D ratio, weight-to-heated-perimeter, calculated and provide fireproofing thickness as required to meet UL Designs and North Carolina Building Code.
 - 1) Refer to NCBC, Section 721.5.2.2.

1.2 ACTION SUBMITTALS

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

1. Material List: Provide an inclusive list of required fireproofing materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying fireproofing materials.

B. Shop Drawings: Structural framing plans indicating the following:

1. Locations and types of surface preparations required before applying fireproofing.
2. Extent of fireproofing for each construction and fire-resistance rating, including the following:
 - a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1) For steel joist assemblies, include applicable fire-resistance design designations, with each steel joist tested with the same maximum tensile stress as each steel joist indicated on Drawings. Design designations with steel joists tested at lower maximum tensile stress than those indicated are not permitted.
 - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
3. Treatment of fireproofing after application.

1.3 INFORMATIONAL SUBMITTALS

- A. Calculations: Provide W/D calculations and a schedule of fireproofing thicknesses required for each beam size scheduled.
- B. Product Certificates: For each type of fireproofing, signed by product manufacturer.
- C. Qualification Data: For Installer and testing agency.
- D. Compatibility and Adhesion Test Reports: From fireproofing manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by fireproofing manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed fireproofing.
- F. Research/Evaluation Reports: For fireproofing (ICC-ES reports if available).
- G. Field quality-control test and special inspection reports.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its fireproofing to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single manufacturer.
- C. Fireproofing Testing: By a qualified testing and inspecting agency engaged by Owner to test for compliance with specified requirements for performance and test methods.
 - 1. Fireproofing materials are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Testing is performed on specimens of fireproofing that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
 - 3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
- D. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.
 - 1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.

2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with fireproofing materials.
- E. Fire-Test-Response Characteristics: Provide fireproofing 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. Identify bags containing fireproofing with appropriate markings of applicable testing and inspecting agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for SFRM serving as direct-applied protection tested per ASTM E 119.
 2. Surface-Burning Characteristics: Comply with ASTM E 84.
- F. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- G. Manufacturer's Technical Representative: A manufacturer's representative/fire protection specialist shall be on-site during application of mock-up and start-up of fireproofing installation.
- H. Mockups: For fireproofing, apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Extent of Mockups: Approximately 100 sq. ft. of surface for each product indicated.
 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. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to fireproofing including, but not limited to, the following:
1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
 2. Review and finalize construction schedule and verify sequencing and coordination requirements.
 3. Review weather predictions, ambient conditions, and proposed temporary protections for fireproofing during and after installation.
 4. Review surface conditions and preparations.
 5. Review field quality-control testing procedures.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Comply with manufacturer's written instructions for delivery, storage and handling of fireproofing materials. Protect fireproofing materials from freezing.
- B. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
- C. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- D. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing material dries thoroughly.

1.7 COORDINATION

- A. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch any damaged or removed areas.
- B. Sequence and coordinate application of fireproofing with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of fireproofing material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 - 3. Avoid unnecessary exposure of fireproofing material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 - 4. Do not apply fireproofing material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fireproofing material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fireproofing material.
 - 5. Do not apply fireproofing material to metal floor deck substrates until concrete topping has been completed.
 - 6. Do not begin applying fireproofing material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
 - 7. Defer installing ducts, piping, and other items that would interfere with applying fireproofing material until application of fire protection is completed.
 - 8. Do not install enclosing or concealing construction until after fireproofing material has been applied, inspected, and tested and corrections have been made to defective applications.
- C. Coordination of Work: Review other Sections of these Specifications in which primers are provided to ensure compatibility of the total fireproofing 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 coatings specified over substrates primed by others.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form signed by Contractor and by Installer, in which manufacturer agrees to repair or replace fireproofings that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of fireproofing from substrates.

- b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
- 2. Warranty Period: Two years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- C. Asbestos: Provide products containing no detectable asbestos.

2.2 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

- A. Material Composition: Manufacturer's standard product, factory-mixed, dry formulation of gypsum plaster binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
- B. Standard-Density Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, mixed with water at Project site to form a slurry or mortar before conveyance and application.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carbolite Company
 - b. GCP Applied Technology
 - c. Isolatek International
 - d. Southwest Fireproofing Products Co.
 - 2. Bond Strength: Minimum 200-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
 - 3. Density: Not less than 15 lb/cu.ft. and as specified in the approved fire-resistance design, according to ASTM E 605.
 - 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.
 - 5. Combustion Characteristics: ASTM E 136 or ASTM E 1354.
 - 6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 10 or less.
 - 7. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 1,440 psf.
 - 8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
 - 9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
 - 10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
 - 11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.

12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.
13. Finish: Manufacturer's standard finish for concealed application.

2.3 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fireproofing materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: For use on each substrate and with each sprayed fireproofing product, provide primer that complies with one or more of the following requirements:
 1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
 2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Adhesive for Bonding Fireproofing Material: Product approved by manufacturer of fireproofing and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fireproofing material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- F. Reinforcing Fabric: Glass- or carbon-fiber fabric reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fireproofing materials with substrates under conditions of normal use or fire exposure.
 3. Objects penetrating fireproofing material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fireproofing material.

- B. Verify that concrete work on steel deck has been completed.
- C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.
- D. Conduct tests according to fireproofing material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.
- F. Examine substrates, areas, and conditions, with the Applicator present, under which fireproofing application will be performed for compliance with requirements and conditions affecting coating performance.
 - 1. Proceed with fireproofing application only after unsatisfactory conditions have been corrected and surfaces receiving coating are thoroughly dry.
 - 2. Start of coating will be construed as the Applicator's approval of surfaces and conditions within a particular area.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
- D. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- E. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fireproofing products after application.

3.3 APPLICATION, GENERAL

- A. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fireproofing material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply fireproofing that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.

2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:

1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit construction roof traffic during, or after the application of fireproofing.

- E. Install metal lath, as required, to comply with fire-resistance ratings and fireproofing material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fireproofing material. For auxiliary materials, use anchorage devices of type recommended in writing by fireproofing manufacturer. Attach accessories where indicated or required for secure attachment of lath to substrate.

- F. Coat substrates with bonding adhesive before applying fireproofing material where required to achieve fire-resistance rating or as recommended in writing by fireproofing manufacturer for material and application indicated.

- G. Extend fireproofing material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by fireproofing manufacturer, install body of fireproofing covering in a single course.

- H. Spray apply fireproofing materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

3.4 APPLICATION, SPRAY FIRE-RESISTIVE MATERIAL

- A. Apply SFRM in thicknesses and densities not less than those required to achieve unrestrained fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if indicated.

- B. Provide a uniform finish complying with description indicated for each type of material and matching Architect's sample or, if none, finish approved for field-erected mockup.

- C. Finish: Apply fireproofing to produce the following finishes:

1. Concealed Locations: Spray-textured finish with no further treatment.
2. Exposed Locations: Smooth, troweled finish with surface markings eliminated and edges squared or spray-textured finish rolled to remove excessive roughness. Provide mock-up for Architect's approval.

- D. Cure SFRM according to product manufacturer's written recommendations.

- E. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspection and prepare reports for fireproofing.

- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- C. Tests and Inspections: Testing and inspecting of completed applications of fireproofing shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
 - 1. Test and inspect as required by the IBC, Subsection 1705.13, "Sprayed Fire-Resistant Materials."
- D. Remove and replace applications of fireproofing that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.
- E. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

3.6 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to recommendations of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Final Acceptance.
- C. Repair or replace work that has not successfully protected steel.

END OF SECTION 078100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer's Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Firm shall hold current certification by third party attesting to its ability to select and install firestopping in accordance with performance requirements, have established management system for firestopping and employ trained supervisor (DRI) to maintain oversight of firestopping installation.
 - 1. Certification for Firestopping Firms: Firm shall be certified by one of the following:
 - a. Factory Mutual Global: FM Standard 4991.
 - b. UL Qualified Firestop Contractor.

2. Qualification for Superintendent: Superintendent shall have a minimum of 3 years experience in firestopping.
 3. Qualification for Firestop Installer: Trained individual in accordance with requirements of certification of firm.
 - a. Firestop Installers Training (FIT) Level 1 by Specified Technologies, Inc.
 - b. Certified 3M Trained by 3M Fire Protection Products.
 - c. Hilti Basic Firestop Training
 - d. Similar training by manufacturers listed in Part 2.
 4. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems

shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hilti Construction Chemicals, Inc.
 - b. Specified Technologies Inc.
 - c. 3M Fire Protection Products.
 - d. Tremco.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- B. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. Specified Technologies Inc.
 - 3. 3M Fire Protection Products.
 - 4. Tremco.

2.3 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
 - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- D. Head of Wall Sealing: Comply with requirements of UL HW-D-0042 or equivalent design.
 - 1. Contractor's Option: Spray or sealant products may be used.
 - a. 3M; FireDam Spray or FD 150+ Sealant

- b. Grace Construction Products; FlameSafe 3000 Spray or FS 900 Sealant
 - c. Hilti; CP672 Firestop Spray or CP 606 Sealant
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- D. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 2. Exterior joints in horizontal traffic surfaces.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 4. Interior joints in horizontal traffic surfaces.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants and joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- B. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's 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 Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Ten years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 Articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of available colors including premium colors.
 - 1. Where color is indicated to "match adjacent substrates" provide either manufacturer's standard color if matching color is available, or, if not available, provide field tintable custom color.

2.3 SILICONE JOINT SEALANTS

- A. Silicone Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Single Component, Nonsag, Neutral-Curing Silicone Sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 790
 - b. GE Momentive SilPruf LM SCS2700
 - c. Pecora Corporation; 890
 - d. Sika Corporation; 290
 - e. Tremco Incorporated; Spectrem 1
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 100/50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M (Masonry), G (Glass), A (Aluminum), and, as applicable to joint substrates indicated, O (Other).
 - 6. Non-staining for natural stone substrates.
 - 7. Field-tintable to match adjacent substrates.
 - 8. Exterior Joint Locations:
 - a. Cast-in-place concrete, vertical construction joints,
 - b. Unit masonry, vertical control and expansion joints,
 - 1) Basis of Design for Brick: Tremco; Dymeric 240FC, Baptist Brick Color
 - c. Exterior vertical joints between different materials listed above,
 - d. Exterior perimeter joints between materials listed above and frames of doors, windows, and louvers,
 - e. Exterior control and expansion joints in ceilings and other overhead surfaces,
 - f. Other vertical or horizontal non-traffic joints.
 - 9. Interior Joint Locations:
 - a. Vertical control and expansion joints on exposed interior surfaces of exterior walls,
 - b. Interior perimeter joints of exterior openings.

C. Single-Component, Traffic Exposure, Neutral-Curing Silicone Sealant:

1. Products:
 - a. Dow Corning Corporation; 890-SL
 - b. Pecora Corporation; 300 SL
 - c. Sika Corporation; 728 SL
 - d. Tremco Incorporated; Spectrem 900 SL
2. Type and Grade: S (single component) and P (pourable).
3. Class: 100/50.
4. Uses Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, A, and O, as applicable to joint substrates indicated.
6. Exterior Joint Locations:
 - a. Cast-in-place concrete slabs, horizontal nontraffic and traffic isolation and contraction joints,
 - b. Other exterior horizontal traffic joints.
7. Interior Joint Locations:
 - a. Interior ceramic and dimension stone tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.

D. Single-Component, Mildew-Resistant, Neutral-Curing Silicone Sealant:

1. Products:
 - a. Dow Corning Corporation; 786
 - b. Pecora Corporation; 898
 - c. Sika Corporation; SikaSil N
 - d. Tremco; Tremsil 600 White
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Interior Joint Locations:
 - a. Interior tile expansion, control, contraction, and isolation joints in vertical surfaces.
 - b. Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

2.4 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik; Chem-Calk 300
 - b. Pecora; BC-158
 - c. Tremco; General Purpose Butyl Sealant
2. Exterior Joint Locations: Under door thresholds.

2.5 LATEX JOINT SEALANTS

A. Latex Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products:
 - a. BASF Building Systems; Sonolac

- b. Bostik, Inc.; Chem-Calk 600
 - c. Pecora Corporation; AC-20+
 - d. Tremco Incorporated; Tremflex 834
2. Interior Joint Locations:
- a. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances,
 - 1) Color: Paintable white.
 - b. Other non-dynamic interior joints including between interior wall surfaces and casework.
 - 1) Color: Clear.

2.6 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining 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.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. BASF Building Systems
 - b. Hilti
 - c. Pecora Corporation
 - d. Tremco
2. Interior Joint Locations: Acoustical interior joints for concealed and exposed joints.

2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), or B (bicellular material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Consult the sealant manufacturer to confirm the specific backer material to be used for the specific project and application, and submit to Architect the manufacturer's written recommendations.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates

and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- 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

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type recommended by manufacturer to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Installation of Preformed Foam Sealants: Install secondary seal at depth sufficient to allow installation of properly sized backer rod and liquid sealant in front of secondary seal. Comply with manufacturer's written instructions.
1. Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing 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 compliance with sealant manufacturer's written instructions.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control 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 with manufacturer's written recommendations.
- 3.4 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.5 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 079513 - EXPANSION JOINT COVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes expansion joint cover assemblies.

1.2 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 expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
 - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion joint cover assembly.
 - 2. Expansion joint cover assembly location cross-referenced to Drawings.
 - 3. Nominal, minimum, and maximum joint width.
 - 4. Movement direction.
 - 5. Materials, colors, and finishes.
 - 6. Product options.
 - 7. Fire-resistance ratings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by a qualified testing agency.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of typical expansion joint cover assembly 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 Final Acceptance.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.
- C. Expansion Joint Design Criteria:
 - 1. Type of Movement: Thermal.
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Minimum Joint Width: As indicated on Drawings.
 - c. Maximum Joint Width: As indicated on Drawings.
 - 2. Type of Movement: Seismic.
 - a. Joint Movement: As indicated on Drawings.

2.3 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated below or comparable product by one of the following:
 - 1. Balco, Inc. (Basis of Design)
 - 2. Construction Specialties
 - 3. InPro Corporation
 - 4. MM Systems Corporation
 - 5. Watson Bowman Acme Corp.

2.4 EXPANSION JOINT COVERS

- A. Compression-Seal Parking Deck Joint Cover: Complying with ASTM E1612/E1612M. Elastomeric seal designed to always stay in compression. Install using manufacturer's recommended lubricant adhesive.
 - 1. Basis of Design: Balco; BCSW-200
 - 2. Application: Slab to wall.
 - 3. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 4. Seal: Preformed elastomeric extrusion.
 - a. Color: As selected by Architect from manufacturer's full range.

2.5 MATERIALS

- A. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.
- B. Urethane Sealant: Manufacturer's recommended sealant.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.
- D. Moisture Barrier: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
- E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.
- C. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- D. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

- E. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work, so complete assemblies comply with performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- F. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals, and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Final Acceptance.

END OF SECTION 079513

SECTION 081113 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal frames.

B. Related Sections:

1. Section 099123 "Interior Painting" for field painting hollow metal frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.

- C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal frame.

1.5 QUALITY ASSURANCE

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steelcraft; an Ingersoll-Rand company (Basis of Design)
2. Ceco Door Products; an Assa Abloy Group company
3. Curries Company; an Assa Abloy Group company

2.2 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 minimum A60 (galvannealed) metallic coating.
- C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Powder-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 C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.3 INTERIOR HOLLOW METAL FRAMES

- A. Heavy-Duty Frames: SDI A250.8, Level 2.
 1. Physical Performance: Level B according to SDI A250.4.
 2. Materials: Uncoated, cold-rolled steel sheet, 16 gauge thickness.
 - a. Provide A60 galvanized coating at wet locations.
 3. Construction: Full profile welded.
 4. Exposed Finish: Prime.
- B. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick.

2.5 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - 5. Door Silencers: Except on weather-stripped doors, 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.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

2.6 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 - 4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: 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.
- 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.

END OF SECTION 081113

SECTION 081216 - ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior aluminum frames for glazing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

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. Shop Drawings: For aluminum frames:

1. Include elevations, sections, and installation details for each wall-opening condition.
2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
3. Include details of anchorages, joints, field splices, connections, and accessories.
4. Include details of moldings, removable stops, and glazing.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard sizes.

D. Product Schedule: For aluminum frames. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum frames to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of each type of aluminum frame in typical wall 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 Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. EFCO Corporation
 2. Kawneer
 3. Oldcastle BuildingEnvelope
 4. Tubelite
 5. YKK AP America Inc.

2.2 COMPONENTS

- A. Aluminum Framing: ASTM B 221, with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch thick.
- B. Glazing Frames: Extruded aluminum, not less than 0.062 inch thick; for 3/8-inch glass thickness.
1. Glazing Plane: Match existing.
- C. Trim: Extruded aluminum, not less than 0.062 inch thick; removable, snap-in glazing stops, without exposed fasteners.
- D. Frame and Trim Finish: Clear anodized aluminum.

2.3 ACCESSORIES

- A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
- B. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated; in black.
- C. Glass: As specified in Section 088000 "Glazing."
1. Glass Thickness: Minimum 3/8-inch thick, or as required to limit deflection to 1/175 of clear span.

2.4 FABRICATION

- A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.
- B. Machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.
- C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
- D. Fabricate components to allow secure installation without exposed fasteners.

2.5 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that wall thickness does not exceed standard tolerances allowed by throat size of indicated aluminum frame.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install aluminum frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer's written instructions.
- B. Install frame components in the longest possible lengths with no piece less than 48 inches; components 96 inches or shorter shall be one piece.
 - 1. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
 - 2. Secure clips to extruded main-frame components and not to snap-in or trim members.
 - 3. Do not leave screws or other fasteners exposed to view when installation is complete.
- C. Glass: Install glass according to Section 088000 "Glazing" and aluminum-frame manufacturer's written instructions.

3.3 CLEANING AND ADJUSTING

- A. Inspect installation, correct misalignments, and tighten loose connections.
- B. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 and 610.
- C. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 081216

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Requirements for veneer matching.
5. Doors to be factory finished and finish requirements.
6. Fire-protection ratings for fire-rated doors.

C. Samples: For factory finished doors, applied to actual door face materials, approximately 12 by 12 inches.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which 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. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Masonite Architectural; Marshfield, Signature Series (Basis of Design)
2. Lambton Doors
3. Oshkosh Door Company
4. VT Industries, Inc./Eggers Industries

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWT's, AWMAC's, and WI's "Architectural Woodwork Standards."
- B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.
1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- C. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- D. Structural-Composite-Lumber-Core Doors: Structural Composite Lumber: WDMA I.S.10.
1. Screw Withdrawal, Face: 700 lbf.
 2. Screw Withdrawal, Edge: 400 lbf.
- E. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: Match existing.
3. Cut: Match existing.
4. Match between Veneer Leaves: Match existing.
5. Assembly of Veneer Leaves on Door Faces: Match existing.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. 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 10 feet or more.
8. Exposed Vertical and Top Edges: Same species as faces.
9. Core: Particleboard, unless otherwise indicated.
10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Species compatible with door faces.
2. Profile: Manufacturer's standard shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

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. Comply with requirements in Section 088000 "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Factory finish all doors.
 2. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Transparent Finish:
1. Grade: Custom.
 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish or System 11, catalyzed polyurethane.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Filled finish.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 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.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior and exterior access doors and frames.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 INFORMATIONAL SUBMITTALS

- A. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acudor Products, Inc.
 - 2. J. L. Industries, Inc.
 - 3. Karp Associates, Inc.
 - 4. Larsen's Manufacturing Company.

5. MIFAB, Inc.
6. Milcor Inc.
7. Nystrom, Inc.
8. Williams Bros. Corporation of America (The)

B. Interior Recessed Access Doors with Concealed Flanges:

1. Description: Fabricate door in the form of a pan recessed 5/8 inch for gypsum board infill. Provide frame with gypsum board bead for concealed flange installation.
2. Locations: Wall and ceiling.
3. Door Size: As indicated on Drawings or as required for access.
4. Uncoated Steel Sheet for Door: Nominal 0.060-inch-thick with factory prime finish.
5. Frame Material: Same material and thickness as door.
6. Hinges: Continuous piano.
7. Latch: Cam latch operated by screwdriver.

C. Exterior Flush Access Doors:

1. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum 2-inch-thick fiberglass insulation.
2. Optional Features: Piano hinges.
3. Locations: Soffit.
4. Door Size: 24 by 24-inches unless otherwise indicated on Drawings.
5. Aluminum Sheet for Door: Nominal 0.045 inch, with manufacturer's standard powder-coat finish.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Cam latch operated by screwdriver.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Aluminum Extrusions: ASTM B221, Alloy 6063.
- D. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- E. Frame Anchors: Same material as door face.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Provide mounting holes in frames for attachment of units to wood framing.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
 1. Concealed Flanges: For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 1. For recessed panel doors, provide access sleeves for each latching device. Furnish plastic grommets and install in holes cut through finish. Grommet color shall be as selected by Architect from manufacturer's full range.
- F. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.4 FINISHES

- 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: 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.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates 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

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Exterior manual-swing entrance doors and door-frame units.

B. Products installed, but not furnished, under this Section include the following:

1. Door hardware furnished under Section 087100 "Door Hardware."

1.2 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glazing-to-glazing contact.
 - e. Noise or vibration created by wind and by thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
 - h. Failure of operating units.

- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Professional engineer shall be legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.
2. Seismic Loads: As indicated on Structural Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than $1/8$ inch and clearance between members and operable units directly below them to less than $1/16$ inch.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding percent of span.
 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Structural Drawings.
 2. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.
- G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- H. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- I. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- J. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- K. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than 50 as determined according to NFRC 500.
- L. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.45 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
 - 2. Show sill pan.
 - 3. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
 - 4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Verification:
 - 1. For each type of exposed finish required, in manufacturer's standard sizes.
 - 2. Sill Pan: Full-size factory fabricated unit.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Detail anchorage system to substrate.
 - 3. Include design calculations.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Thermal Conductance Certificates: Provide project-specific certificates for glazed aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: AAMA-certified thermal conductance values for each glazed aluminum-framed entrance and storefront.
- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- E. Field quality-control reports.
- F. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain aluminum-framed storefront and entrances and glazed aluminum curtain wall systems by a single manufacturer, engineered by same manufacturer and coordinated completely.
- B. Manufacturer's Qualifications: Provide entrances and storefront produced by a single manufacturer with not less than 10 years successful experience in the fabrication of assemblies of the type and quality required.
- C. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. Installer shall have successfully completed not less than two projects of similar size, scope, and complexity as that of this Project within the last three years.
- D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- F. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- H. Mockups: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, to demonstrate flashing of openings, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Notify Architect and Owner's Representative seven days in advance of dates and times when mockups will be constructed.
 - 3. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 4. 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. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum storefront that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum storefront with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Coordinate doors, frames, door hardware, and other work for proper installation of door hardware, furnished under other Sections and installed in aluminum-framed entrance and storefront systems. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components.
 2. Warranty Period: 5 years from date of Final Acceptance.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 1. Warranty Period: 20 years from date of Final Acceptance.

1.11 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
 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 six 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. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.
 - a. Coordinate with door hardware supplier for replacement of defective items.
3. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 1. EFCO Corporation
 2. Kawneer
 3. Oldcastle BuildingEnvelope
 4. Tubelite
 5. United States Aluminum
 6. Wausau Window and Wall Systems
 7. YKK AP America Inc.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Center glazed unless otherwise indicated on Drawings.
 4. Finish: High-performance organic finish.

- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. 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.
- D. Sill Pan: Provide high performance flashing by manufacturer. Extruded aluminum, factory fabricated to provide sealed end dams, finished to match storefront; designed to direct water away from building when installed horizontally at sill. If manufacturer offers a similar sill pan as part of aluminum-framed entrance and storefront system, submit details and product data including finishes, for consideration and approval by Architect. PVC is not acceptable.
- E. Sill Extension: Extruded aluminum. Profile as indicated on Drawings.
- F. Perimeter Filler: Provide perimeter filler / backer plate to close back of frame and facilitate placement of backer rod and sealant.
 - 1. Back Plates: Furnish jamb and head framing members with manufacturer's standard continuous back plates, unless continuous plates are integral to the design of the framing system.
- G. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- H. Concealed Flashing: Dead-soft, 0.018-inch thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- I. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: As recommended by manufacturer for joint type and as follows:
 - 1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with other system components with which it comes in contact; recommended by weatherseal-sealant and aluminum-framed-system manufacturers for this use.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 2-1/4-inch overall thickness, with minimum 0.188-inch 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.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: Wide stile; 5-inch nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 - 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.6 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Entrance door hardware to be furnished under Section 087100 "Door Hardware."
 - 1. All hardware preparation and installation to be performed as Work of this Section.
- B. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 - 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.7 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing.
 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At 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.

2.9 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Apply finishes to formed metal after fabrication unless otherwise indicated.
- C. 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.

2.10 ALUMINUM FINISHES

- A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and 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.
 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, 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

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Provide fasteners at spacing as recommended by manufacturer.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Installation at Sill: Install sill pan system in accordance with manufacturer's written instructions.

1. Set sill pan in a continuous bed of sealant or apply a nominal 6 inch wide strip of 60 mil self-adhering waterproofing membrane to the bottom of the pan and where a penetration might be required to comply with specified performance requirements.
2. Do not apply sealant between flashing pan and bottom of frame, except as required by manufacturer to comply with specified performance requirements. Set sill members in watertight sill flashing pan. Do not penetrate bottom of flashing pan and/or attach sill members to vertical leg of angle unless required by manufacturer to comply with specified performance requirements.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Section 088000 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

- a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
- b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 FIELD QUALITY CONTROL

A. Contractor/Installer Testing: Contractor/Installer shall be prepared to provide the following minimum testing as part of the Work.

- 1. Testing shall be in compliance with AAMA 501.2. Testing shall be performed at approximately 10 percent and 50 percent completion. A minimum of 2 test areas to be tested at each phase. Additional testing may be required if installation crew changes or if construction is suspended and resumed after an extended period of time. Coordinate with Architect's representative for areas to be tested, testing times, and representative's availability to monitor tests.

B. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections.

C. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

- 1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- 2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.

D. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

F. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

- 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work under this section comprises the furnishing and installation of finish and security hardware specified herein and noted on drawings for a complete and operational system, including any electrified door hardware components including finish and security hardware and auto operators for aluminum entrance doors, FRP doors, and wood doors.
- B. Items include but are not limited to the following:
 - 1. Hinges: Butt-type and Continuous
 - 2. Flush Bolts: Manual and Automatic
 - 3. Exit Devices
 - 4. Locksets and Cylinders
 - 5. Push Plates - Pulls
 - 6. Coordinators
 - 7. Closers / ADA Operators
 - 8. Kick, Mop and Protection Plates
 - 9. Stops, Wall Bumpers, O.H. Controls
 - 10. Thresholds, Gasketing and Door Bottoms
 - 11. Silencers
 - 12. Miscellaneous Trim and Accessories
 - 13. Electrified Hardware Items, Controls and Power Supplies

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 specifications sections apply to this section.

1.3 RELATED WORK

- A. Work specified elsewhere that should be examined for its effect upon this section.
 - 1. Section 081113, Hollow Metal Doors and Frames
 - 2. Section 081416, Flush Wood Doors
 - 3. Section 084113, Aluminum-Framed Entrances and Storefront
 - 4. Section 088000, Glazing
 - 5. Section 088813, Fire-Resistant Glazing.
 - 6. Division 26 Electrical.
 - 7. Division 28 Electronic Safety and Security.
 - 8. Division 1 Alternates.

1.4 REFERENCES SPECIFIED in this section subject to compliance by:

- A. NFPA-80-2013 - Standard for Fire Doors and Windows.
- B. NFPA-101- Life Safety Code as adopted.
- C. NC Electrical Code – 2014, effective as April 2016.

- D. ADA - The Americans with Disabilities Act - Title III - Public Accommodations
- E. ANSI-A117.1-1992 American National Standards Institute - Accessible and Usable Buildings and Facilities
- F. ANSI-A156.5-American National Standards Institute - Auxiliary Locks and Associated Products
- G. UL 10 C – UBC 7.2 – Positive Pressure Testing
- H. ANSI-A250.6-1997/SDI -107 "Hardware on Steel Doors" (reinforcement- application).
- I. Architectural Woodwork Institute (AWI)
- J. International Building Code as Adopted / NC Building Code as adopted
- K. U.L. - Underwriter's Laboratories
- L. WHI - Warnock Hersey International, Division of Intertek Testing Services
- M. State and Local Codes including Authority Having Jurisdiction.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations and sections, materials, gauges, finishes, door thickness, door swing, stile and rail dimensions, veneers, undercuts, fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.
- B. Hardware Schedule: Submit copies of schedule in accordance with Division 1 – "Submittals", General Requirements. Schedule to be in vertical format, listing each door opening, including: Keying Information, handing of opening, all hardware scheduled for each opening or otherwise required to allow for proper function of door opening as intended, and finish of the hardware. At doors with door closers or door controls include degree of door opening. All submittals (schedules, cut sheets, wiring diagrams, operational descriptions and elevation drawings) shall be reviewed and approved by the UNCW Project Manager and by the UNCW Locksmith Supervisor Physical Plant. UNCW Business Applications shall review the submittal for electrified hardware applications, along with the wiring diagrams. These submittals shall be approved by UNCW prior to ordering of materials. The Hardware Supplier shall submit the schedules and all templates within three (3) weeks from the date the purchase order is received from the GC.
- C. Manufacturer's Catalog Cuts: Submit manufacturer's cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule.
- D. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.
- E. Wiring Diagrams: Provide complete wiring diagrams for each opening requiring electrified hardware. Provide a copy with each hardware schedule submitted after approval. Supply a copy with delivery of hardware to job site and another copy to the Owner at time of job completion. All electrical components shall be listed by opening, in the hardware submittals.
- F. Operational Descriptions: Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening including all conditions of ingress and egress. Provide a copy with each

hardware schedule submitted for approval. Supply another copy with delivery of hardware to job site and another copy to owner at time of job completion.

- G. Elevation Drawings: Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval. Supply another copy with delivery of hardware to job site and another copy to the Owner at time of job completion.

1.6 QUALITY ASSURANCE

- A. Door Openings Supplier shall be a qualified direct distributor of products to be furnished. In addition, the distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience, who will be available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the door opening assembly.
- B. All hardware used in labeled fire or smoke rated openings to be listed for those types of openings and bear the identifying label or mark indicating UL (Underwriter's Laboratories) or Warnock Hersey (WHI) approved for fire. Exit Devices. Non-labeled openings to be listed for panic application.
- C. Pre-Installation Meetings: The Contractor shall initiate and conduct a jobsite meeting with the supplier and installer, and all related trades for mechanical hardware, and a meeting for Electronic Hardware. This meeting shall convene at least one month prior to commencement of the related work. All approved shop drawings and schedules shall be made available to all related trades as required for work to be performed. Prior to installation of wiring, and installation of power supplies for electronic hardware, arrange conference between supplier, installers and related trades to review materials, procedures, review door opening functions, and coordinating related work. The Owner's Construction Project Manager and the Locksmith Supervisor -Physical Plant shall attend all pre-install meetings. The Owner's Construction Project Manager, and the Business Applications Services representative.
- D. All hardware products furnished to the project, shall be furnished by an authorized distributor of each product to insure quality compliance, service, and warranty of the products. Product representatives of the following products: Locksets, Closers, Exit Devices, Electrified Hardware, shall conduct a certified training session at the pre-install meeting for product installation training.
- E. All closers and exit devices shall be mounted to doors with the manufacturer's recommended sex-nut/through-bolt fasteners.
- F. Keying Conference: A keying Conference shall be conducted at least 30 days after approval of all hardware submittals on each Building Project. Attendance to this conference shall be: UNCW Construction Project Manager, the area Department Heads, the UNCW Locksmith -Physical Plant and the Schlage Key representative.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Finish Hardware
 - 1. Furnish all hardware with each unit clearly marked and numbered in accordance with the hardware schedule. Include door and item number for each.
 - 2. Pack each item complete with all necessary parts and fasteners.
 - 3. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.
 - 4. Inventory hardware jointly with the General Contractor, Hardware Distributor and Installer until each is satisfied that all products and counts are correct. Any shortages shall be replaced immediately.

5. The General Contractor shall provide secure lock up in a clean, dry, well-lit space for finish and security hardware storage as delivered to the Project. Control handling and installation of hardware and security items to insure the installation will not be delayed due to hardware losses, both before and after installation.
6. Hardware shipped to the jobsite is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-biodegradable packing.
7. The Manufacturers' Representative and Owners Representative will make several inspections of the installation of Finish and Security Hardware during that phase of construction. Any deficiencies in installation of all products in this Section shall be corrected before installation continues.

1.8 SEQUENCING AND SCHEDULING

- A. Deliver all openings components to the job site in a timely manner so not to delay progress of other trades.

1.9 WARRANTY

- A. Hardware Warranty: Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:
 1. Hinges: Life of the building.
 2. Mortise Locksets shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
 3. Door closers shall carry manufacturer's 30-year warranty against manufacturing defects. Exit devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
 4. Continuous gear hinges shall carry manufacturer's Lifetime warranty to be free from defects in material and workmanship.
 5. ADA operators shall carry manufacturer's 2-year warranty against manufacturing defects and workmanship.
 6. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.
- B. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work. Inspect the work within 24 hours after receipt of notice from the UNCW Construction Project Manager.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish finish hardware with all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for a long life under hard use.
- B. Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors designated by the Architect according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer. **All door closers and exit devices shall be thru-bolted mounted.**
- C. All thresholds shall be fastened with machine screws and anchors. Where specified in the hardware sets, security type fasteners of the type called for are to be supplied.
- D. Design of all fastenings shall harmonize with the hardware as to material and finish.

- E. Provide products as hereafter specified. Substitutions other than those manufacturers listed a Approved Equals must be approved, in writing, via addenda, prior to bid. Procedure for substitutions shall be as outlined in Division 1. No substitutions will be considered after award of contract.

2.2 HINGES

- A. Provide full mortise type, five knuckle exposed tip design ball bearing hinges as specified. Continuous Geared Hinges shall be furnished for all exterior doors with card reader applications and at all Storefront and FRP type doors. Continuous Hinges shall be furnished at any interior door as directed by the Project Manager during the project review. Verify all continuous hinge applications. Unless otherwise scheduled, the required weight, size and hinge type shall be as follows:
1. Butt hinges required per door leaf:
 - a. Doors up to 5'0" in height 2 hinges
 - b. Doors over 5'0" to 7'6" in height 3 hinges
 - c. Doors over 7'6" to 9'0" in height 4 hinges
 2. Size and weight requirements:
 - a. Doors over 36" in width, shall have extra-heavy weight hinges, 5 inches in width.
 - b. At exterior openings, hinge pins shall be stainless steel.
- B. Finish: Except as otherwise indicated, provide all hinges with the following finish:
1. Exterior US32D (630) Satin Stainless Steel
 2. Interior US26D (652) Satin Chrome
- C. Approved Butt Hinge Manufacturers: Ives, McKinney, Hager
- D. Approved Continuous Geared Hinge Manufacturer: Select, Ives, McKinney. **At exterior doors with card reader function, the continuous hinge shall be Select 11HD EMS/CTW-8 RP (removable panel).**

2.3 LOCK CYLINDERS AND KEYING

- A. General: Provide ten (10) temporary keyed construction cores for the contractor's use during the construction period of the project. Furnish keyed construction cores at all exterior doors, including the cylinder dogging at exit devices. Balance of locks/cylinders may be furnished with factory produced plastic plugs. Construction control and operating keys and cores shall not be part of the Owner's permanent keying system, or furnished on the same keyway as the Owner's permanent keying system. Permanent cores and keys shall be keyed to the approved keying schedule. All cylinders shall be Everest 7-pin, interchangeable core and keyed to existing patented Factory-Registered Grand Masterkey System.
- B. Permanent keys and cores shall be stamped with applicable key mark for identification. These visual key control codes shall not include the actual key cuts. Permanent keys/key blanks will also be stamped "Do Not Duplicate."
- C. The Owner's existing key system: "Schlage", with the specific keyway to be determined by the Owner, and with the Schlage Key representative.
- D. Furnish keys in the following quantities:
1. each Master keys per set
 2. 3 each Change Keys per keyed core or keyed group. Do not cut keys for any exterior door cylinders where the UNCW card reader function is specified.
 3. each Construction Master keys
 4. 3 each key blanks per core

- E. At project completion, the UNCW Locksmith Shop shall install the permanent keyed cores. All construction cores and keys shall be returned to the University Construction Project Manager for return the hardware supplier. All permanent keyed cores, keys, and key blanks shall be delivered directly to the Owner from the hardware supplier via Registered Delivery, Return Receipt Required.

2.4 LOCKS, LATCHES AND BOLTS

- A. Mortise Lock and Latches shall be as manufactured by Schlage, series L9000, Grade 1. Trim design shall be as manufactured by Schlage, 17N. Finish shall be: 626 (US26D), unless otherwise noted. Locksets and Latchsets shall be UL listed for use on fire doors. Furnish latch bolts with 3/4" minimum throw. Deadbolts shall have 1" throw. All strikes shall be curved lip. Lock function at all instructional/classroom door shall include a thumb-turn and an indicator on the inside trim to indicate the status of the outside trim: locked/unlocked. Acceptable manufacturers: Schlage L series; Falcon M series; Best 42H series.
- B. Provide knurled levers or abrasive strips to all rooms that are considered hazardous, in order to comply with the North Carolina Building Code requirements. This includes but is not limited to all electrical, mechanical and telecommunications rooms.
- C. Auxiliary Locks shall be Grade 1, as scheduled.
- D. Padlocks: Provide a hardware set for each project to include the following padlock as manufactured by: Schlage KS41F1200 x less core x 2" shackle. Verify with the Owner's Construction Project Manager for the quantity required for each project. The Owner will not accept an "add" change order for padlocks not include with the Hardware Submittal.
- E. Cylinders used in any locking mechanism such as in Rolling/Overhead/Coiling Doors, or for a remote Key Switch, shall be furnished with a Schlage Everest 7-pin SFIC housing and keyed core, and follow the UNCW keying requirements listed per Section 2.3 of this document.
- F. Locksets at all teaching spaces shall include a classroom locking function with a thumb-turn and an indicator.

2.5 CLOSERS

- A. General: One manufacturer for closer units throughout the Project Work, including surface closers, overhead-concealed closers, and electromagnetic hold-open closers.
- B. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
- C. Surface Closers:
 - 1. Door Closers shall be heavy-duty type, Grade 1 with thirty-year warranty.
 - 2. Cylinders shall be cast iron with forged 1-1/2" diameter steel.
 - 3. Closer main arm shall be forged on all closers. Parallel arms shall be rigid forearms.
 - 4. Shaft/Pinion shall be 1-1/16" diameter shaft and double heat-treated.
 - 5. All closers shall have "all-weather" hydraulics to operate in temperatures from -30degrees to 120 degrees F. without valve adjustments and conforms to positive pressure fire test standards UL10C & UBC 7-2.
 - 6. All stop arm and spring stop arm closers shall have bronze bushings and shoulder bolts. Where stop type arm is specified, closer shoe shall have a cast-in solid stop. Where spring stop arm is specified, arm shall provide an additional five-degree cushion.
 - 7. Closers shall be certified by an independent testing laboratory to Ten Million (full load) cycles.

8. Closers shall be ISO 2000 certified. Units shall be stamped with date-of-manufacture code.
9. Closers shall be thru-bolt mounted.
10. Provide plates, brackets and special templating as specified and per manufacturer's recommendation.
11. Spring power shall be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped.
12. Acceptable manufacturers: LCN 4111/4011 series; Norton 7501PR series w/ extra duty forged arms; Sargent 281 series with extra duty forged arms.
13. Pressure relief valves are not acceptable.

2.6 EXIT DEVICES

- A. General: All devices shall be the products of one manufacturer to provide for proper installation and servicing. Devices shall be furnished non-handed and capable of direct field conversion of all available trim functions. All devices shall carry a three-year warranty against manufacturing defects and workmanship.
1. Furnish all devices with stainless steel touch bars. Plastic parts are not acceptable.
 2. Furnish all exit devices with deadlocking latchbolts or guarded latch (GL) feature.
 3. Furnish all exit devices with cast metal end caps.
 4. Furnish built-in damping / silencing feature. Furnish heavy duty, chassis mounted design with removable cover to eliminate the need to remove the device from the door for maintenance or cylinder change out. Device springs shall be compression type only. Torsion springs are not acceptable.
 5. Furnish roller strikes with all exit devices.
 6. Furnish stabilizers similar to Von Duprin 154 with keyed locking feature at all removable mullions.
 7. All Exit Devices and mullions shall be from one manufacturer.
 8. All latchbolts shall be deadlocking. Latchbolts shall be moly-coated.
 9. Lever trim shall be solid cast material with a break-away feature to limit damage to the unit from vandalism.
 10. Exit devices at instructional/classrooms shall include a thumb-turn and indicator on the device head.
 11. Acceptable Manufacturer: Von Duprin 99/98 series devices; Precision 2100 series x deadlocking latchbolts and roller strikes; Sargent 80 series with deadlocking latchbolts and roller strikes. Keyed removable mullions shall be as manufactured by Von Duprin KR4954/9954 series, and shall include stabilizer kits. Mullion shall be by the same manufacturer as the exit device.
 12. Surface Vertical Rod devices are not acceptable.
 13. Concealed exit device application shall be concealed cable device and only as approved by the UNCW Locksmith. Concealed cable device shall include the option for less bottom cable, electrified options as required for card reader applications, fire-rating as required by the door, and out-side trim options which match the rim devices.
 14. Electrified functions shall be specified and furnished as Request to Exit and Electric Latch Retraction (QEL-RX-LC). Each opening specified with Request to Exit and Electric Latch Retraction shall be specified and furnished with a PS914-4RL power supply box. The power supply boxes and electrified exit devices shall be by the same manufacturer. Power supply box shall have a regulated output, field selectable for either 24VDC @2 amps or 12VDC @ 4amps. The input shall be universal at 120VAC @ 1 amp or 240VAC @ 0.5amp. The option board compatibility shall include 2 relay QEL panic device control board. The power supply shall have five (5) knockout holes for conduit connection with a terminal block that handles up to 14 gauge size wire.

2.7 DOOR TRIM UNITS

- A. Fasteners: provide manufacturers standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units): either machine screws or self-tapping screws.

- B. Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.
- C. Fabricate protection plates (armor, kick or mop) not more than 2" less door width on stop side and not more than 1" less door width on pull side X the height indicated.
- D. Metal Plates: Stainless Steel .050" (U.S.18ga.), unless otherwise specified.
- E. Approved Manufacturers: Ives/ Rockwood/Trimco

2.8 MISCELLANEOUS

- A. Provide manual or automatic flush bolts, including coordinators and mounting brackets at pairs of doors as specified.
- B. Generally provide door stops or controls at each door leaf. Provide wall, floor, or stops and holders as specified.
- C. Provide OH Controls, stops or holders as specified.
- D. Approved Manufacturers: Ives/ Glynn Johnson/ Rixson

2.9 THRESHOLDS /WEATHERSTRIP

- A. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, size and profiles shown or specified. Provide non-corrosive fasteners as recommended by manufacturer for application intended. Except as otherwise indicated provide ADA standard aluminum thresholds of type, size and profile specified.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from manufacturers stock.
- C. Acceptable Manufacturers: National Guard/Pemko/Zero.
- D. Provide thresholds that are 1" wider than frame depth. Unless return closed ends are specified, furnish thresholds 2" longer than the opening width for notching around the frame. Hardware installer shall be responsible for notching thresholds to the frame by field measuring after the door opening assembly is installed.

2.10 DOOR SILENCERS

- A. At all hollow metal frames furnish gray resilient rubber silencers. Quantity: Three each at single door openings; two each at double door openings.

2.11 KEY LOCK BOX

- A. Furnish one each secure storage box for emergency personnel use. This box shall be located per the architect and fire marshal at the exterior of the building.
- B. Dual Lock Model, Recessed Mount, 1/4" plate steel housing, 5/8" thick steel door with interior gasket seal. Vault and Lock UL listed. Lock has 1/8" dust cover with tamper seal mounting capability. Vault has anti-theft re-locking mechanism with drill resistant hard-plate lock protector.

- C. Acceptable Manufacturers: Knoxbox 3200

2.12 ELECTRIFIED HARDWARE FUNCTIONS

- A. General: Operation of the card reader access control system shall be managed by the UNCW Business Applications Department. *Card readers, credentials, monitoring, alarms shall be furnished under Division 28. Refer to the current UNCW Standards & Procedures for Installation of Access Control Equipment* by UNCW Physical Security & Access Department.
- B. Where specified in the Finish and Security Hardware Sets openings shall be furnished with all materials listed to provide the security function and control required by the Owner.
- C. The door function shall be as specified in the Part 3 – Hardware Sets. Finish Hardware submittals shall include operational descriptions and wiring diagrams for all electrified hardware functions.
- D. Card reader equipment shall be provided and installed by the Division 28 subcontractor. Handicap Operators shall be installed and terminated by the General Contractor and/or the Hardware Installer. UNCW Information Technology Systems Division shall install required bridge wiring after door operator is installed. All electrical applications specified shall be confirmed by review with the UNCW Physical Security & Access Department.
- E. All exterior building entry doors shall be specified with one or more of the above listed electrical functions, or the openings shall be specified with provision for future card readers and electrified hardware.

2.13 OWNERS SERVICE AND STOCK ITEMS

- A. Provide four (4) Final Field use Finish and Security Hardware Schedules with Cut Sheets, Service Instructions and any materials pertinent to the service and maintenance of the Hardware and Systems.
- B. Provide four (4) Sets of all Electrical Drawings illustrating Riser and Point-to-Point Diagrams.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by the Architect. Mounting Height of exit devices, with the exception of full glass aluminum doors, shall not interfere with lite kits shown on elevations. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Install with only fasteners furnished with each hardware item, or exact match if additional fasteners are required. Any substitute fastener shall be approved by UNCW Locksmith Supervisor prior to installation. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Section. Do not install surface mounted items until finishes have been completed on the substrates involved.
 - 1. Gaskets: install jamb-applied gaskets before door closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals. Trim astragals to tops of sweeps.
 - 2. Locate floor stops not more than 4 inches from the wall.
 - 3. Drill pilot holes for fasteners in wood doors and/or frames.

~~4.~~ Thru-Bolts: All closers and exit devices.

- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant complying with requirements specified in Section 079200 "Joint Sealants".
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.
- G. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
- H. Certified installers: Contractor's personnel, and Section 087100 supplier/installer shall be certified prior to installation of exit devices, locksets, closers, and electrified hardware, including ADA operators, electric strikes, electrified hinges, electric exit devices, and electric door releases. Certification shall be obtained by attendance of manufacturer's training at the pre-install meeting. The manufacturer's representative shall provide written certification to the installers and a copy of the certification shall be provided to the Contractor, the University Construction Project Manager, and the University Locksmith Supervisor. Hardware Installers working on the project site not certified by attending the above specified training, shall be removed from the project site.
- I. All conduit, outlet and backboxes, provisions for 120VAC power, wiring types required for access control system, pulling of correct wiring to appropriate locations, fire alarm system installation and interface, coordination of electrical applications shall be furnished by the Electrical Contractor (Division 26).

3.2 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and system of each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by Hardware Installation. Avoid the use of caustic cleaners which may mar the finish of the Hardware.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to work one week before final acceptance and make final check and adjustment of all hardware in such space or area. Clean operating items as necessary. Adjust door controls after HVAC Test and Balance to insure proper door control.
- D. Instruct Owners Personnel in the proper adjustment and maintenance of Hardware and Systems during the final adjustment period.
- E. Continued Maintenance Service: Approximately six (6) months after acceptance of the Project, the Installer, accompanied by the Owners representative and the Finish and Security Hardware Representative(s) shall return to the project and survey the project, readjusting any items as required to restore the hardware to its original function. Replace any failed products failed due to faulty design, materials or installation. Prepare and deliver to the Owners representative a written report of any potential problems in the performance of the hardware with recommended service procedures to insure continued correct function of the products.

3.3 INSPECTION

A. Door Hardware Supplier's Field service:

1. Inspect door hardware items for correct installation and adjustment prior to Owner's permanent core installation. The hardware installer shall be present for this inspection. The Owner shall give written notice to the Contractor 5 days prior to inspection. The Hardware Supplier shall submit a written report of the inspection, including any exceptions noted during the inspection, to the Contractor, Architect, the University Construction Project Manager, and the University Locksmith Supervisor.
2. The Hardware Installer Shall reply to the inspection report within three (3) working days after the inspection report. The Installer's response shall include a list of the required repairs or alterations, and the date the repair work shall be performed. All repairs, and or alterations shall be performed with one week after the Installer's response report.
3. The written inspection report and the Installer's repair report shall become part of the Contractor's punch list report. All reports shall be submitted to the project architect, and the University Construction Project Manager.

PART 4 - HARDWARE SETS

Access Control System equipment, including card readers, wiring, connections, and any system related work shall be provided by others. All Electrical work shall be by Div. 26.

HARDWARE SET NO. 01

Provide each with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050BDC 17N L583-363	626	SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 02

Provide each with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954	689	VON
2	EA	PANIC HARDWARE	CD-98-DT	626	VON
3	EA	SFIC EVEREST CORE	80-037	626	SCH
3	EA	SFIC MORTISE CYL.	80-132	619	SCH
		(CAMS AS REQUIRED)			
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4011	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	GASKETING	BY DOOR/FRAME MANUFACTURER		
1	EA	ASTRAGAL	BY DOOR/FRAME MANUFACTURER		
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	655A-223	A	ZER
2	EA	DOOR CONTACT	BY ACCESS CONTROL SUPPLIER	BLK	SCE

DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM FOR MONITORING.

HARDWARE SET NO. 03

Provide each with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD-98-NL	626	VON
2	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SFIC MORTISE CYL.	80-132	619	SCH
		(CAMS AS REQUIRED)			
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011	689	LCN
1	SET	GASKETING	BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	655A-223	A	ZER
1	EA	DOOR CONTACT	BY ACCESS CONTROL SUPPLIER	BLK	SCE

DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM FOR MONITORING.

HARDWARE SET NO. 04

Provide each with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954	689	VON
1	EA	PANIC HARDWARE	CD-98-DT	626	VON
1	EA	PANIC HARDWARE	CD-98-NL	626	VON
4	EA	SFIC EVEREST CORE	80-037	626	SCH
3	EA	SFIC MORTISE CYL.	80-132	619	SCH
		(CAMS AS REQUIRED)			
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4011	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	GASKETING	BY DOOR/FRAME MANUFACTURER		
1	EA	ASTRAGAL	BY DOOR/FRAME MANUFACTURER		
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	655A-223	A	ZER
2	EA	DOOR CONTACT	BY ACCESS CONTROL SUPPLIER	BLK	SCE

DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM FOR MONITORING.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass for storefront framing and doors.
2. Glazing sealants and accessories.

B. Related Sections:

1. Section 057313 "Glazed Decorative Metal Railings" for laminated glass used in glass railings.

1.2 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches square.

1. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass and glazing products, from manufacturer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

C. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."

2. IGM Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

- E. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
- F. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 1. Warranty Period: 10 years from date of Final Acceptance.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 1. Warranty Period: 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Roller Wave Distortion: Maximum of 0.003 inch from peak to valley in the center of lite, and a maximum of 0.008 inch within 10.5 inches of the leading or trailing edge.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as recommended by manufacturer for application.

2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 - 2. Spacer: Manufacturer's standard spacer material and construction.
 - 3. Desiccant: Molecular sieve or silica gel, or blend of both.

- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.5 MONOLITHIC-GLASS TYPES

- A. Glass Type **TMG**: Clear fully tempered float glass.
1. Thickness: 3/8-inch.
 2. Provide safety glazing labeling.

2.6 INSULATING-GLASS TYPES

- A. Glass Type **NG**: Low-e-coated, insulating glass.
1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. AGC Glass Company
 - b. Guardian Industries Corp.
 - c. Vitro Glass
 2. Overall Unit Thickness: 1 inch.
 3. Thickness of Each Glass Lite: 1/4 inch.
 4. Outdoor Lite: Fully tempered float glass.
 - a. Tint: Match existing.
 5. Low-E Coating: Sputtered on second surface.
 6. Interspace Content: Air or argon.
 7. Indoor Lite: Clear, fully tempered float glass.

2.7 GLAZING GASKETS

- A. Compression Gaskets: Molded or extruded gaskets of type and material indicated below and of profile and hardness required to maintain watertight seal:
1. Silicone dense compression gaskets complying with ASTM C 1115.
 2. Silicone soft compression gaskets complying with ASTM C 509, Type II, black.

2.8 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Owner from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. May National Associates, Inc.; Bondaflex Sil 290.

- d. Pecora Corporation; 890.
- e. Sika Corporation, Construction Products Division; SikaSil-C990.
- f. Tremco Incorporated; Spectrem 1.

2.9 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.11 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to 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 where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. 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.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a 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.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit 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. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Final Acceptance. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes non-load-bearing steel framing members for the following applications:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Grid suspension systems for interior gypsum ceilings and soffits.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Indicate yield strength of steel, section properties, limiting heights and spans.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Structural Properties: Manufacturer's published data on Structural Properties are calculated based on allowable stress design conforming to AISI "Specification of the Design of Cold-Formed Steel Structural Members."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Conventional Steel Framing: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allsteel & Gypsum Products, Inc.
 - 2. Craco Manufacturing Inc.
 - 3. Southeastern Stud and Components
 - 4. Steel Construction Systems
 - 5. The Formetal Co. Inc.
 - 6. The Steel Network
 - 7. Steelform USA
- B. Dimpled Studs: Subject to compliance with requirements, provide one of the following:
 - 1. ClarkDietrich; ProStud 20 and ProStud 22.
 - 2. MarinoWARE; Viper 20S.
 - 3. Telling Industries; Viper 20S.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - a. Steel having a yield strength greater than 33 KSI is permitted.
 2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized.
 - a. Equivalent coatings are not acceptable and not allowed.
- B. Minimum Base-Metal Thickness: Provide minimum base metal thickness specified or greater as required by the manufacturer's published performance data based on the following criteria:
1. Yield Strength of steel.
 2. Deflection Limits:
 - a. Gypsum Wallboard: L/240.
 3. Limiting Heights: As indicated on Drawings.
 4. Spans: As indicated on Drawings or as recommended by manufacturer.
 5. Applied Loads:
 - a. Gypsum Wallboard: 5 psf.
 6. Depth: As indicated on Drawings.
- C. Studs and Runners: ASTM C 645. Use either conventional steel studs and runners or dimpled steel studs and runners.
1. At standard gypsum board partitions.
 - a. Conventional Studs: 0.027 inch (22 ga.).
 - b. Dimpled Studs: 0.0179 inch, at 70 ksi yield strength (22 ga. equivalent)
 - c. Dimpled Studs: 0.0190 inch, at 50 ksi yield strength (20 ga. equivalent)
 2. At supporting wall-hung cabinets.
 - a. Conventional Studs: 0.0312 inch (20 ga.).
 - b. Dimpled Studs: 0.022 inch, at 65 ksi yield strength (20 ga. equivalent)
 - c. Dimpled Studs: 0.0190 inch, at 50 ksi yield strength (20 ga. equivalent)
 3. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Firestop Tracks: 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. Products: Subject to compliance with requirements, provide one of the following:

- a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip
 - b. Grace Construction Products; FlameSafe FlowTrak System
 - c. Marino/WARE; Fas Track
 - d. Metal-Lite, Inc.; The System
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.033 inch.
- G. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch wide flanges.
1. Depth: 1-1/2 inches or as indicated on Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.033 inch.
 2. Depth: As indicated on Drawings.
- I. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped.
- J. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch wide flanges.
1. Depth: 3/4 inches or as indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Cast-in-place anchor, designed for attachment to concrete forms or post-installed, expansion anchor.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 - b. Depth: As indicated on Drawings.
3. Dimpled Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.025 inch.
 - b. Depth: As indicated on Drawings.
4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical.

2.4 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
 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 thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

- C. Install studs so flanges within framing system point in same direction. Space studs as indicated on Drawings.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: 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.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 5. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- E. Direct Furring: Screw to framing.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.2 ACTION SUBMITTALS

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

1.3 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, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
 - 1. Installation of gypsum panels before areas are enclosed and conditioned is done at Contractor's own risk. Damaged panels shall be removed and new panels installed at Contractor's expense and will not be deemed cause for additional time.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Gypsum.
 2. Certaineed Corporation
 3. Georgia-Pacific Gypsum LLC
 4. Lafarge North America Inc.
 5. National Gypsum Company
 6. Temple-Inland Inc.
 7. USG Corporation.

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: **5/8 inch**.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: **5/8 inch**, Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long leg receives joint compound; use at exposed terminations of gypsum board panels.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (Control) Joint: Galvanized or aluminum-coated steel sheet or rolled zinc control joint with 1/2 inch to 3/4 inch grounds for drywall finishes. Staple or screw grounds to panel face.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. MM Systems Corporation.
 - d. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of **ASTM B 221**, Alloy 6063-T5.
3. Profile: Reveal.
4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use joint setting compound.
 3. Fill Coat: For second coat, use joint setting compound.
 4. Finish Coat: For third coat, use drying-type compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal doors and frames.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- 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** thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. 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.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine weathertight building enclosure, with Installer present, and verify that delivery, storage, and installation of gypsum panel products will not be affected by exposure to moisture beyond limits recommended by manufacturer.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- 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 panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch** of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Form control and expansion joints with space between edges of adjoining gypsum panels.
- G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft.** in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch** wide joints to install sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide **1/4- to 1/2-inch** wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

- J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- L. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to 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 panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 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. Control Joints: Install control joints at locations indicated on Drawings, or, if not shown, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

- 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 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. This finish level shall be used for areas to receive smooth paint finish.

3.6 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Owner 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 Owner seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Owner, 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.
 - g. Installation of through-penetration firestopping and fire-resistant joint sealants, with identification labels.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Delegated-Design Submittal: For seismic restraints for ceiling systems.
 - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 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.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 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. Minimum Drawing Scale: 1/8 inch = 1 foot.
- B. Evaluation Reports: For seismic wall angles and seismic separation clips.

- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 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. Acoustical Ceiling Units: Full-size panels equal to 5 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site 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 acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc
 - 2. CertainTeed Corporation
 - 3. USG Interiors, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify materials with appropriate markings of applicable testing and inspecting agency.
 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
- B. Delegated Design: Engage a qualified professional engineer to design seismic restraints for ceiling systems.
- C. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 0-2."

2.3 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. 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 D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS

- A. Acoustical Panel (**ACT-1**):
1. Basis of Design: USG; Olympia Micro ClimaPlus, 4752.
 2. Classification: Provide panels as follows:
 - a. Type and Form: Type IV, mineral base with painted finish; Form 2, water felted.
 - b. Pattern: CE (perforated, small holes and lightly textured).
 3. Color: White.
 4. Light Reflectance (LR): Not less than 0.86.
 5. Noise Reduction Coefficient (NRC): Not less than 0.60.
 6. Edge/Joint Detail: Angled tegular.
 7. Thickness: 3/4 inch.
 8. Modular Size: 24 by 24 inches.

2.5 METAL SUSPENSION SYSTEM

- A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M 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 C 635/C 635M.

- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
1. Basis of Design: USG; DX/DXL
 2. Structural Classification: Intermediate-duty system.
 3. End Condition of Cross Runners: Override (stepped) type.
 4. Face Design: Flat, flush.
 5. Cap Material: Cold-rolled steel.
 6. Cap Finish: Painted white.

2.6 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch-diameter wire.
- C. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- D. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.7 METAL EDGE MOLDINGS AND TRIM

- A. Provide edge moldings and trim from the manufacturer of 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. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 2. 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.
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration with 3/8-inch clearance.
 4. For sprinkler heads and other penetrations, provide 2-inch oversized ring or sleeve through the ceiling to allow for free movement of at least 1 inch in all horizontal directions.
 5. Wall Angle: 7/8-inch wide, approved for use in seismic areas.
 - a. Armstrong Seismic RX with BERC2 Clips.
 - b. Certainteed; CTSPC clips system
 - c. USG; DX main and cross runners with ACM7 clips.

2.8 AUXILIARY MATERIALS

- A. Acoustical Sealant: As specified in Section 079200 "Joint Sealants."
- B. 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.

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. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.
- 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. 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.

6. 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.
 7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 11. Install hanger wire as specified above within 6 inches of each corner of the grid at every light, air diffuser, air return grill, and other equipment items which are installed within or penetrate the ceiling system.
- C. Where area of ceiling exceeds 2500 square feet provide seismic separation joints as indicated, or, if not indicated, as directed by Architect.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
 4. Install seismic edge molding in accordance with manufacturer's written recommendations with all accessories necessary to comply with ICC evaluation report.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels in a basket-weave pattern.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
 5. Paint cut 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.
 6. Install hold-down clips at entrances and in areas required by authorities having jurisdiction; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
 7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.
 8. Install seismic clips as required.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

- B. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

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 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size Samples, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain resilient stair treads and accessories, and rubber floor tile by a single manufacturer.
- 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.

1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products 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 or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable products by one of the following:
 - 1. Johnsonite; Tarkett (Basis of Design)
 - 2. Mannington Commercial
 - 3. Roppe

2.2 RESILIENT BASE (RBS-1)**A. Resilient Base Standard: ASTM F 1861.**

1. Basis of Design: Johnsonite; Millwork Wall Base, Monument Profile
2. Material Requirement: Type TS (vulcanized thermoset rubber) or Type TP (rubber, thermoplastic).
3. Manufacturing Method: Group I (solid, homogenous).
4. Style: Straight.
5. Minimum Thickness: Manufacturer's standard.
6. Height: Nominal 2.5 inches.
7. Lengths: Coils in manufacturer's standard length, but not less than 96 feet.
8. Outside and Inside Corners: Preformed.
9. Color: As selected by Architect from manufacturer's full range.

2.3 RESILIENT MOLDING ACCESSORY**A. Description:**

1. Reducer strips.
2. Transition strips.

B. Material: Rubber or vinyl.**C. Profile and Dimensions: As selected by Architect.****D. Colors and Patterns: As selected by Architect from full range of industry colors.****2.4 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. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install 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.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 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.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Final Acceptance.

END OF SECTION 096513

SECTION 097713 - STRETCHED-FABRIC WALL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes site-upholstered wall systems.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include fabric facing, frame edge and trim, core material, and mounting indicated.
- B. Shop Drawings: For each stretched-fabric system.
 - 1. Include plans, elevations, sections, and installation and system details.
 - 2. Include details at head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate frame-edge profile and core materials.
 - 3. Include details at cutouts and penetrations for other work.
 - 4. Include direction of fabric weave and pattern matching.
- C. Samples: For fabric facing.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which items penetrating or covered by stretched-fabric systems are shown and coordinated with each other, using input from installers of the items involved.
- B. Qualification Data: For Installer.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stretched-fabric systems to include in maintenance manuals. Include fabric manufacturer's written cleaning, stain-removal, restretching, and reupholstering instructions.

1.6 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. Fabric: For each fabric, color, and pattern installed, furnish length equal to 10 percent of amount installed, but no fewer than 10 sq. yd., full width of bolt.
 - 2. Framing and Related Installation Items: Furnish manufacturer's full-length units equal to 5 percent of amount installed, but no fewer than five units, including unopened adhesives.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area as shown on Drawings. Include intersection of wall and ceiling, corners, and perimeters.
 - 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 Final Acceptance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and stretched-fabric system manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install stretched-fabric systems until a permanent level of lighting is provided on surfaces to receive stretched-fabric systems.
- C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.10 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: Two years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 STRETCHED-FABRIC WALL SYSTEMS

- A. Stretched-Fabric Wall System: Manufacturer's standard system consisting of facing material stretched tightly over a frame and core material and secured in the frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FabriTrak Systems, Inc.
 - b. Novawall Systems, Inc.
 - c. Whisper Walls
2. Core: Glass-fiber board, ASTM C612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board.
 - a. Nominal Core Thickness: 2 inches.
3. Core Overlay: Polyester batting, manufacturer's standard thickness.
4. Frame Construction: Manufacturer's standard, continuous, extruded plastic frame (track).
5. Frame Edge: Square profile.
 - a. Fabric-Insertion Point: Manufacturer's standard.
 - b. Nominal Frame Thickness: Match nominal core thickness.
6. Reveals between Panels: Recessed reveals.
7. Facing Material: Fabric, from same dye lot.
 - a. Fabric Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Arcom Fabrics
 - 2) Knoll Textiles
 - 3) Maharam
 - b. Provide fabric without backing.
 - c. Fiber Content: 100 percent polyester.
 - d. Width: 54 inches.
 - e. Applied Treatments: Stain resistance.
 - f. Color and Pattern: As selected by Architect from manufacturer's full range.
8. Acoustical Performance: Sound absorption NRC of 0.95 according to ASTM C 423 for Type A mounting according to ASTM E 795.
9. Panel Height and Width: As indicated on Drawings.

2.2 INSTALLATION MATERIALS

- A. Installation Products: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:
 1. Fasteners: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each area and establish layout of panels and joints of uniform size with balanced borders at opposite edges within a given area.
- B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed according to stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of 24 hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.

3.3 INSTALLATION

- A. Install stretched-fabric systems according to system manufacturer's written instructions.
 - 1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.
 - 2. Install framing around penetrations.
 - 3. Tightly fit framing to adjacent construction and securely attach to substrate.
 - 4. Install core material with full coverage, flush with face of stretched-fabric system frame.
 - 5. Attach frame and core to substrate with adhesive or fasteners or both to support system and prevent deformation of components.
 - 6. Install stretched-fabric systems level and plumb unless otherwise indicated, true in plane, and with fabric square to the grain.
 - 7. Install jointed panels with reveals as indicated.
 - 8. Provide wood or plywood nailing strips and blocking as indicated on Drawings.
- B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.
 - 1. Fabric Direction: Run fabric railroaded.
 - 2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.
 - 3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave aligns with adjacent panels.
 - 4. Fabric Seams: Sewn seams are not permitted.
 - 5. Core Overlay: Evenly stretch over core face and edges; free from puckers, ripples, wrinkles, and sags.
 - 6. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.
 - 7. Stretch fabric tightly and square without puckers, ripples, or distortions. Acclimatize and restretch if recommended by stretched-fabric system manufacturer. Repair distortions, wrinkles, and sagging.

3.4 INSTALLATION TOLERANCES

- A. Edge Straightness: Plus or minus 1/16 inch in 48 inches.
- B. Variation from Level and Plumb: Plus or minus 1/16 inch in 48 inches, noncumulative.
- C. Variation of Joint Width: Not more than 1/16 inch in 48 inches from reveal line, noncumulative.

3.5 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.

- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 097713

SECTION 098433 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
 - 1. Sound-absorbing wall panels.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include wood veneer, panel edge, core material, and mounting indicated.
- B. Shop Drawings: For unit assembly and installation.
 - 1. Include plans, elevations, sections, and mounting devices and details.
 - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
 - 3. Include details at cutouts and penetrations for other work.
- C. Samples: For wood veneer.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which items penetrating or covered by the sound-absorbing wall units are shown and coordinated with each other, using input from installers of the items involved.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include manufacturers' written cleaning instructions.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area. Include intersection of wall and ceiling, corners, and perimeters.
 - 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 Final Acceptance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- C. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOUND-ABSORBING WALL UNITS

- A. Sound-Absorbing Wall Panel (**WWP-1**): Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
 - 1. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 - a. Architectural Components Group, Inc.; MicroPerf Flat Panel Series 1 (Basis of Design)
 - b. Armstrong World Industries
 - c. Decoustics; a Saint Gobain company
 - 2. Panel Shape: Flat.
 - 3. Mounting: Back mounted with manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.
 - 4. Core: Manufacturer's standard core.
 - 5. Acoustic Fabric: Factory-attached to back of panels.
 - 6. Edge Construction: Manufacturer's standard.
 - 7. Edge Profile: Square.
 - 8. Corner Detail in Elevation: Square with continuous edge profile indicated.
 - 9. Reveals between Panels: Recessed reveals.
 - 10. Facing Material: Wood veneer.
 - a. Wood Species: As selected by Architect from manufacturer's full range.
 - b. Perforation: Micro perforations, 0.5 mm holes, spaced 1.9 mm on center, in offset alignment.
 - 11. Nominal Core Thickness: 3/4 inch.
 - 12. Panel Size: As indicated on Drawings.

2.2 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch variation from reveal line in 48 inches, noncumulative.

3.4 CLEANING

- A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Fiber-cement board.
 - 3. Galvanized metal.

1.2 DEFINITIONS

- A. Gloss Levels: ASTM D 523
 - 1. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees.
 - 2. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
 - 3. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
 - 4. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
 - 5. Gloss Level 5: 35 to 70 units at 60 degrees.
 - 6. Gloss Level 6: 70 to 85 units at 60 degrees.
 - 7. Gloss Level 7: More than 85 units at 60 degrees.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 CLOSEOUT SUBMITTALS

- A. Mix Formula: For each color provided.

1.5 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. Paint: 2 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - 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 Final Acceptance.

1.7 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.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.

2.3 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Non-Traffic Surfaces: Including GFRC column covers and trim.
 - 1. Prime Coat: Bonding primer.
 - a. Benjamin Moore; Insl-X Stix Waterborne Bonding Primer, SXA-110
 - b. PPG; Seal Grip Acrylic Primer, 17-921XIC
 - c. Sherwin-Williams; Extreme Bond Exterior Bonding Primer, B51W00150
 - 2. Intermediate Coat: Exterior alkyd urethane enamel matching topcoat.
 - 3. Topcoat: Exterior alkyd urethane enamel.
 - a. Benjamin Moore; Corotech Alkyd Urethane Enamel Semi-Gloss, V201
 - b. PPG; Speedhide Exterior WB Alkyd Semi-Gloss, 6-1510XI
 - c. Sherwin-Williams; Pro Industrial Alkyd Urethane Semi-Gloss, B53-1150
- B. Cement Board Substrates:
 - 1. Prime Coat: Factory applied.
 - 2. Intermediate Coat: Exterior latex matching topcoat.
 - 3. Topcoat: Exterior latex.
 - a. Benjamin Moore; Ultra Spec Waterborne Exterior, N449
 - b. PPG; Speedhide Exterior 100% Acrylic, 6-900XI Line
 - c. Sherwin-Williams; A-100 Exterior Acrylic Latex Satin, A82W00151
- C. Galvanized-Metal Substrates:
 - 1. Prime Coat: Shop primed.
 - 2. Intermediate Coat: Light industrial coating matching topcoat.
 - 3. Topcoat: Light industrial coating, exterior, water based, direct-to-metal.
 - a. Benjamin Moore; Super Spec HP DTM Acrylic Semi-Gloss, P29
 - b. PPG; Pitt-Tech Plus Int/Ext Semi-Gloss DTM Industrial Enamel, 90-1210
 - c. Sherwin-Williams; Pro Industrial DTM Acrylic Semi-Gloss, B66W01151

2.4 PAINT ADDITIVES

- A. Mildewcide Additive: Manufacturer's recommended broad-spectrum fungicide additive compatible with paint. Mix in accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems 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 paints, 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 paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. 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 paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Steel.
 - 2. Galvanized metal.
 - 3. Gypsum board.

1.2 DEFINITIONS

- A. Gloss Levels: ASTM D 523
 - 1. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees.
 - 2. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
 - 3. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
 - 4. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
 - 5. Gloss Level 5: 35 to 70 units at 60 degrees.
 - 6. Gloss Level 6: 70 to 85 units at 60 degrees.
 - 7. Gloss Level 7: More than 85 units at 60 degrees.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 CLOSEOUT SUBMITTALS

- A. Mix Formula: For each color provided.

1.5 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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - 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 Final Acceptance.

1.7 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.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.

2.3 INTERIOR PAINTING SCHEDULE

A. Galvanized-Metal Substrates:

1. Prime Coat: Waterborne galvanized-metal primer.
 - a. Benjamin Moore; Super Spec HP Acrylic Metal Primer, P04
 - b. PPG; Pitt-Tech Plus Int/Ext DTM Industrial Primer, 90-912
 - c. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66W310
2. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
3. Topcoat: Institutional low-odor/VOC interior latex (semigloss).
 - a. Benjamin Moore; Ultra Spec Zero VOC Semi-Gloss, 539
 - b. PPG; Speedhide Zero Interior Zero-VOC Latex Semi-Gloss 6-4510XI
 - c. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W2600 Series

B. Steel Substrates:

1. Prime Coat: Rust-inhibitive primer (water based).
 - a. Benjamin Moore; Acrylic Metal Primer, M04
 - b. PPG; Pitt-Tech Plus Int/Ext DTM Industrial Primer, 90-912
 - c. Sherwin-Williams; Pro-Industrial Pro-Cryl Universal Primer, B66W310
2. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
3. Topcoat: Institutional low-odor/VOC interior latex (semigloss).
 - a. Benjamin Moore; Ultra Spec Zero VOC Semi-Gloss, 539
 - b. PPG; Speedhide Zero Interior Zero-VOC Latex Semi-Gloss 6-4510XI
 - c. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W2600 Series

C. Gypsum Board Substrates:

1. Prime Coat: Primer sealer, interior, institutional low odor/VOC.
 - a. Benjamin Moore; Ultra Spec Zero VOC Primer, 534
 - b. PPG; Speedhide Interior Zero VOC Latex Sealer, 6-4900XI
 - c. Sherwin-Williams; ProMar 200 Zero Interior Latex Primer, B28W02600
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC (Low-Sheen/Eggshell - Gloss Level 3).
 - a. Benjamin Moore; Ultra Spec Zero VOC Low Sheen, 537
 - b. PPG; Speedhide Zero Interior Zero-VOC Latex Eggshell 6-4310XI
 - c. Sherwin-Williams; ProMar 200 Eg-Shel Latex, B20W2600 Series

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

- D. Proceed with coating application only after unsatisfactory conditions have been corrected.

- 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems 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 if any.

- C. Clean substrates of substances that could impair bond of paints, 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 paint systems indicated.

- D. Gypsum Board Substrates: Verify that finishing compound is dry and sanded smooth.

- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

- G. 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 paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.

- 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Backrolling: Back roll all spray applications on walls and ceilings to allow for touch up.
- F. Apply primers and finish coats in accordance with manufacturer's recommended dry-film thickness, square foot per gallon, and mil thickness per coat. Do not add solvent or thinner to paint and coating products.
- G. Allow adequate curing time before handling and before applying subsequent coats. Comply with manufacturer's written instructions.
- H. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switchgear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 MARKING AND IDENTIFICATION

- A. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
 - 2. Be repeated at intervals not exceeding 20 feet measured horizontally along both sides of the wall or partition; and
 - 3. Include red lettering not less than 2 inches in height, incorporating the suggested wording: "X HOUR FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording approved or required by Authority Having Jurisdiction (AHJ). Replace "X" with the appropriate designated hourly rating.
 - 4. Apply a minimum one-inch wide bright red horizontal line, both sides of wall, interrupted for approved text, at the required interval.

5. Refer to the Drawings for locations of walls and for applicable types and ratings.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099123

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of code-required interior and exterior signs:
 - 1. Dimensional characters.
 - 2. Panel signs.
- B. Owner-Provided Signage: The Owner shall furnish and install interior room identification signage and exterior building signage not required by code and not indicated on Drawings.

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 ACTION SUBMITTALS

- A. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
- C. Samples: Provide samples of each sign component for verification of compliance with requirements indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each sign type indicated from one source from a single manufacturer.
- B. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- C. Installer Qualifications: Fabricator of products.
- D. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1, including character height, width, and spacing.

- E. Accessibility Requirements: Comply with ADA Accessibility Guidelines. Machine-cut copy characters from opaque acrylic sheet and chemically weld onto the acrylic sign panel face or use photopolymer process, or computer guided sandblasting, rotary or laser engraving process to produce raised copy and Braille tags. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1.6 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

1.7 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.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of polymer finishes beyond normal weathering.
 - b. Deterioration of graphic image, colors, and sign lamination.
 - 2. Warranty Period: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- B. Fiberglass Sheet: Molded, seamless, thermosetting, glass-fiber-reinforced polyester panels with a minimum tensile strength of 15,000 psi when tested according to ASTM D 638 and with a minimum flexural strength of 30,000 psi when tested according to ASTM D 790.
- C. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- D. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- E. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.

2.2 DIMENSIONAL CHARACTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A. R. K. Ramos

2. Avalis Wayfinding Solutions
3. Best Manufacturing
4. Matthews International, Inc.
5. Metallic Arts, Inc.
6. Signage Industries Corporation

B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.

1. Character Material: Aluminum.
2. Character Size: As indicated on Drawings and as required by code for building identification.
3. Graphic Content:
 - a. Building identification (numbering) as required by code including, but not limited to, street address and building number.
4. Graphic Style: Letter style as selected by the Architect from manufacturer's standard options.
5. Projection: 1 inch.
6. Mounting: Concealed studs, noncorroding for substrates encountered.
7. Finish: Baked enamel.
 - a. Color: Color as selected by Architect from manufacturer's full range.

2.3 PANEL SIGNS

A. Manufacturers of Panel Signs: Subject to compliance with requirements, provide products by one of the following:

1. ASI Sign Systems, Inc.
2. Best Manufacturing Company
3. Corum Signs, Inc.
4. Signature Signs
5. 2/90 Sign Systems

B. General: Provide signs as indicated on Drawings, or as required by code, including but not limited to, toilet rooms, stairs, elevators, exits, electrical rooms, and assembly spaces.

1. Provide graphics and Braille as required by code.
2. Fabricate panel signs to comply with the requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed condition within a tolerance of plus or minus 1/16 inch measured diagonally.

C. Unframed Panel Signs: Fabricate unframed panel signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Beveled.
2. Corner Condition: Provide corners rounded to 1/2 inch radius.
3. Signs: Nominal 3/16 inch thick, plastic or phenolic, with the following:
 - a. Raised characters, 1/32 inch minimum, at least 5/8 inch high but not higher than 2 inches;
 - b. Raised numbers, 1/32 inch minimum, at least 1 inch high numbers;
 - c. Raised Braille, 1/32 inch minimum, Grade 2;
 - d. Signs shall be etched and have raised integral symbols and letters. Applied symbols and letters are not acceptable.

- e. Each room sign shall list the room number and a room identification name in both Braille and in the characters and numbers described above.
- 4. Character Font: As selected by Architect.
- 5. Size: Provide typical 8 by 8 inch size, unless otherwise noted on the Drawings or as needed to meet requirements.
- 6. Exterior Signs: Provide fiberglass units for exterior applications.
- 7. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.
 - a. Color: Color matching sign or black. Confirm final color selection with Architect.
- 8. Copy for each sign shall be provided during the Construction Phase of the project.
- 9. Handicapped Symbols: Provide one combination handicapped symbol, male and female caricatures, and room identification sign for every room where handicapped facilities are provided, such as toilet rooms.
- 10. Color: Color for background and letter colors as selected by Architect from manufacturer's full range in non-glare finish.
- 11. Mounting Height Above Floor: 48 inches minimum above floor measure to baseline of lowest raised character and 60 inches maximum above floor measured to baseline of highest raised character.

2.4 ACCESSORIES

- A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- B. Adhesives: As recommended by sign manufacturer.
- C. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- D. 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.

2.5 FINISHES

- 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 colors as selected by the Architect from the manufacturer's full range.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
- C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - 1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.

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, are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 - 1. Interior Signage: Manufacturer's standard two-face tape and silicone-adhesive mounting, unless otherwise indicated.
 - a. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - b. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 - 2. Exterior Signage: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 3. Install signage in accordance with approved shop drawings, ADA requirements, and at locations indicated on the Drawings and in conformance with manufacturer's instructions using only approved materials and methods.
- C. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount letters at the projection distance from the wall surface indicated.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 101400

SECTION 109300 - SKATEBOARD DETERRENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Skateboard deterrents.

1.2 ACTION SUBMITTALS

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

1.3 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. Skateboard Deterrents: Five units with anchors.

PART 2 - PRODUCTS

2.1 SKATEBOARD DETERRENTS

- A. Products: Subject to compliance with requirements, provide one of the following products:
 - 1. Ravensforge Coneg; SkateBlock Flat Bar
 - 2. Skate Stoppers; FR Series
 - 3. Stop-A-Grind Skateboard Deterrents; Series 200 Wall Stops
- B. Construction: Aluminum.
- C. Location: Provide where indicated on Drawings with spacing not to exceed 36 inches on center.
 - 1. Coordinate location of skateboard deterrents with joints in wall cap.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Castings: ASTM B 26/B 26M.
- B. Anchors, Fasteners, Fittings, and Hardware: Stainless steel; commercial quality, vandal and theft resistant, and concealed.

2.3 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

- B. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

2.4 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, 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. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated.
- B. Install skateboard deterrents level, plumb, true, and securely anchored and positioned at locations indicated on Drawings.

END OF SECTION 109300

SECTION 220000 - GENERAL PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Instructions to Bidders, General Conditions of the Contract, Supplementary General Conditions and Division 01 Specifications Sections bound herewith are a component part of Division 22 specifications. Comply with all provisions, details and instructions of these sections in the accomplishment of work covered under Division 22.
- B. Furnish all labor, materials and equipment and incidentals required to make ready for use complete plumbing systems as shown on the Drawings and specified herein.
- C. Where Sub-Contracts are used to perform portions of the work, division of labor between sub trades is the responsibility of the Contractor.
- D. Furnish all labor, materials and equipment and incidentals required to make ready for use complete plumbing systems as shown on the Drawings and specified herein.
- E. Work includes furnishing, installing and testing the equipment and materials specified in other sections of the Division Specifications and shown on the Plumbing Drawings. It is the intent of these Specifications that the plumbing systems shall be suitable in every way for the intended usage. All material and all work which may be reasonably implied as being incidental to the work of this Division shall be furnished at no extra cost.
- F. The general scope work includes, but is not limited to, furnishing, coordinating, and installing the following.
 - 1. Roof drainage systems with connections to site utilities.
- G. Visit all areas of the existing site, buildings and structures (as applicable) in which work under these sections is to be performed. Inspect carefully the existing conditions prior to bidding. Bid submission is evidence that the Contractor has examined the site and existing conditions, understands conditions under which the work will be performed, and takes full responsibility for complete knowledge of all factors governing the work.
- H. Schedule all service interruptions in existing facilities at the Owner's convenience with 72 hours (minimum) notice. Obtain prior approval for each interruption.
- I. Thoroughly test all plumbing systems after installation and make any minor corrections, changes or adjustments necessary for proper functioning of the systems and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.

1.2 SUBMITTALS

- A. Procedures for submittals: Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 01 Specifications Sections.
- B. Transmit each shop drawing submittal with provided Shop Drawing Submittal Cover Form, attached herewith for each item of equipment/material or each specification section/paragraph.

- C. Clearly indicate proposed equipment and/or materials substitutions in shop drawings. Summarize all deviations from the specified quality, functionality, appearance or performance of proposed equipment and/or materials in the preface of each submittal. Include documentation to support deviations.
- D. Provide descriptive data on all materials and equipment as required to ascertain compliance with Specifications.
- E. Design layout shown on drawings is based on physical sizes of reputable equipment manufacturers. If equipment other than models indicated is installed, any resulting conflicts with space, maintenance access, clearances or codes are the responsibility of the Contractor to correct at his expense.
- F. Where specific models and manufacturers of materials and equipment are specified, substitutions as allowed by the specifications and State law will be considered. Substitutions must be equivalent in quality, function, suitability and arrangement to specified equipment. Architect/Engineer to have final authority as to equivalency of substitutions.
- G. Equipment model numbers noted in these specifications or on the drawings are intended to establish a minimum standard of quality and do not necessarily relate to specific options or arrangement as shown. Provide equipment with all standard features and optional features as stated and arranged as shown on the drawings.

1.3 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable state and local codes, standards and regulations.
- B. Furnish all materials and labor which is be required for compliance with codes, standards and regulations, whether specifically mentioned in these specifications or shown on the drawings.
- C. Obtain required construction permit from the authority having jurisdiction and arrange, at the proper time, for all inspections required by such authority. Pay all permit and inspection costs required.

1.4 COORDINATION OF WORK

- A. Contractor is responsible for coordination of work between trades. Provide fully complete and functional systems.
- B. Compare plumbing drawings and specifications with the drawings and specifications for other trades.
- C. Coordinate plumbing installation with the work of other trades. Report any pertinent discrepancies to the Architect/Engineer and obtain written instructions for any necessary revisions. Before starting any construction, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. No extras will be allowed for rework of uncoordinated installations.
- D. Determine exact route and location of each plumbing item prior to fabrication and/or installation. Adjust location of piping and equipment, etc., to accommodate interferences anticipated and encountered.
- E. Right of Way: General priority for right of way is as follows:
 - 1. Items located per regulatory requirement.
 - 2. Piping with pitch requirement (plumbing drains, etc.).
 - 3. Ductwork.
 - 4. Piping without pitch requirement.
 - 5. Electrical wiring (conduits, etc.).

- F. Arrange all work to permit removal (without damage to other parts) of any equipment requiring periodic replacement.
- G. Provide clearance and easy access to any equipment which requires periodic maintenance. Arrange ducts, piping and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging doors and access panels.

1.5 EQUIPMENT AND MATERIALS (GENERAL)

- A. Provide all new materials unless specifically indicated otherwise.
- B. Manufacturers and models listed in drawings and specifications are used for layout and to convey to bidders the general style, type, character and quality of product desired. Listed examples are used only to denote the quality standard of product desired and are not intended to restrict bidders to a specific brand, make, manufacturer or specific name.
- C. Adjust layout, system connections and coordinate with other trades as required to properly install equivalent products.
- D. Where equivalent products are submitted, include all associated costs related to substitution in bid.
- E. Furnish materials bearing the manufacturer's name and trade name. Provide UL label where a UL standard has been established for the particular material.
- F. Furnish standard products of manufacturers regularly engaged in production of equipment types required for the work. Use the manufacturer's latest approved design.
- G. Use the same manufacturer for equipment and materials of the same general type throughout the work to obtain uniform appearance, operation and maintenance.
- H. Protect equipment and materials from dirt, water, chemical or mechanical injury and theft at all times during construction. Provide covers or shelter as required.
- I. If materials or equipment are damaged at any time prior to final acceptance of the work, repair such damage at no additional cost. If materials or equipment are damaged by water, provide replacement no additional cost.
- J. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Notify the Architect/Engineer in writing of any conflicts between any requirements of the contract documents and manufacturer's directions. Obtain written instructions before proceeding with the work. The Contractor is responsible for correction of any work that does not comply with the manufacturer's directions or written instructions from the Architect/Engineer at no additional cost.
- K. Repair any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. Repaint entire damaged panel or section per the field painting specifications in Division 09 at no additional cost.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Refer to individual plumbing sections and Division 01.

1.7 PAINTING

- A. Refer to Division 09.
- B. Protect fixtures, valves, trim, etc. from field painting operations. Do not install escutcheons and trim until painting is complete.

1.8 LOCATIONS AND MEASUREMENTS

- A. Location of plumbing work is shown on the drawings as accurately as possible. Field-verify all measurements to ensure that the work suits the surrounding trim, finishes and/or construction. Provide adjustment as necessary.
- B. Make minor relocations of work prior to installation as required or as directed by the Architect/Engineer at no additional cost.

1.9 SUPERVISION

- A. Contractor to provide an authorized and competent representative to constantly supervise the work from the beginning to completion and final acceptance. Insofar as possible, keep the same foreman and workmen throughout the project duration.
- B. Representatives of Architect/Engineer, Owner, and local inspection authorities will make inspections during the progress of the work. Contractor to accommodate such inspections and correct deficiencies noted.

1.10 QUALITY AND WORKMANSHIP

- A. Contractor to employ skilled tradesmen, laborers and supervisors. Final product to be a neat, well finished, and professional installation.
- B. Remove and replace any work considered substandard quality in the judgment of the Architect/Engineer.

1.11 EXCAVATION, TRENCHING AND BACKFILLING

- A. Provide all excavation, trenching and backfilling as required to complete the work under this Division.
- B. Contractor is responsible for investigating conditions prior to excavating and to exercise care during the excavation to avoid any utilities or other objects which may or may not be shown on the drawings.
- C. Excavate so as not to endanger or damage existing utilities and structures. If damage occurs, repair damage to the satisfaction of the Architect/Engineer at no additional cost.
- D. Lay out location of all ditching at grade and obtain approval from the Architect/Engineer prior excavating.
- E. Remove and dispose of all surplus earth from the site.
- F. Provide suitable backfill materials as required.

- G. Perform excavation, trenching and shoring in accordance with rules and regulations set forth in Article XXI, Bulletin 1 "Trenching" as published in a separate bulletin by the North Carolina Department of Labor, Division of Standards and Inspection Construction Bureau.
- H. Bid excavation work as unclassified with no extra payment for removal of rock, unsuitable soils, etc.

1.12 CLOSING IN WORK

- A. Do not cover up or enclose work until it has been inspected, tested and approved by authorities having jurisdiction over the work. Uncover any such work for inspection and/or test at no additional cost. Restore the work to its original condition after inspection and/or test at no additional cost.

1.13 CUTTING AND PATCHING

- A. Perform all cutting and patching necessary to install work under this Division.
- B. Perform cutting and patching in professional, workmanlike manner.
- C. Arrange work to minimize cutting and patching.
- D. Do not cut joists, beams, girders, columns or any other structural members without written permission from the Architect/Engineer.
- E. Cut opening only large enough to allow easy installation of piping, wiring or ductwork.
- F. Patching material to match material removed.
- G. Restore patched surface to its original appearance at completion of patching.
- H. Where waterproofed surfaces are patched, maintain integrity of waterproofing.
- I. Remove rubble and excess patching materials from the premises.

1.14 INTERPRETATION OF DRAWINGS

- A. Drawings and specifications under this Division are complementary each to the other. Provide any work specified herein and/or indicated on the drawings.
- B. Drawings are diagrammatic and indicate generally the location of fixtures, piping, devices, equipment, etc. Follow drawings as closely as possible, but arrange work to suit the finished surroundings and/or trim.
- C. The words "furnish", "provide", and/or "install" as used in these drawings and specifications are interpreted to include all material and labor necessary to complete the particular item, system, equipment, etc.
- D. Any omissions from either the drawings or specifications are unintentional. Contractor is responsible for notifying the Architect/Engineer of any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

1.15 ACCESSIBILITY

- A. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment to include, but not be limited to, valves, traps, cleanouts, motors, controllers and drain points. If required for accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.
- B. Coordinate exact locations and size of access panels for each concealed device requiring service.
- C. Access panels: Steel construction with 16-gauge frames and 18-gauge panels, factory primed with rust inhibiting paint, finish paint by Contractor. Provide suitable UL listed doors where installed in rated construction.
- D. Coordinate access panel locations with architectural construction.
- E. Access panels are not required for access to work located above a lift-out "T" bar type ceiling.

1.16 PLUMBING WORK IN CONNECTION WITH OTHER CONTRACTS

- A. Provide plumbing services as required for items furnished by other contractors or vendors as shown on the plumbing drawings. Include rough-ins and final connections to equipment. Locations of connections shown on the drawings are approximate and some adjustment of actual connection locations should be anticipated. Coordinate exact connection requirements. Make final connections only after approval of the other contractor or vendor, in the contractor's or vendor's presence.
 - 1. Site Utilities - In general, work under this Division covers work to five feet outside buildings. Extend and connect work under this Division to site utilities as required.

1.17 ALTERNATE BIDS

- A. Alternate Bids are described in relevant sections of the General and Supplemental General Conditions and Division 01 Specification Sections.

1.18 PROJECT RECORD DRAWINGS

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 01 Specification Sections.
- B. As the work progresses, legibly record all field changes on a set of project contract drawings, herein after called the "record drawings."
- C. Accurately show the installed condition of plumbing work on record drawings.

1.19 PHASING OF THE WORK

- A. Schedule work in accordance with the relevant sections of the General and Supplemental General Conditions and Division 01 Specifications Sections.

1.20 PROJECT CLOSEOUT

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 01 Specifications Sections.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220000

SECTION 220010 - EXISTING PLUMBING CONDITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedures for plumbing work in existing building.

1.2 PROJECT CONDITIONS

- A. Conform to the requirements of Division 01 for cutting and patching. Conform to the requirements of Division 02 and Section 220020 for demolition.
- B. Conduct work to minimize interference with adjacent and occupied building areas.
- C. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 - GENERAL

2.1 PATCHING MATERIALS

- A. As specified in individual Sections.

PART 3 - GENERAL

3.1 PREPARATION

- A. Coordinate plumbing service interruptions with the Owner.
- B. Provide temporary and/or permanent plumbing as shown and/or as required by conditions to maintain existing systems in service during construction. Use hot-tapping valves if required.
- C. Existing Plumbing Systems: Maintain existing plumbing systems in service. Disable systems outside construction area only to make tie-ins or switchovers. Obtain permission from the Owner at least 72 hours before partially or completely disabling plumbing. Minimize duration. Make temporary connections as required to maintain service in areas adjacent to work area.
- D. Drawings are based on casual field observation and existing record documents. Survey the affected areas before submitting bid proposal. Report discrepancies to the Architect/Engineer before disturbing the existing installation.
- E. Field-verify existing conditions as related to interconnection of New Work. Determine exact methods of interface to obtain proper operation.
- F. Coordinate existing and New Work interface prior to beginning any work. Adjust work to suit existing conditions. Some deviations in plan layout vs. actual conditions should be expected.
- G. Provide, erect, and maintain temporary dust screens, safeguards, barricades, signage and similar measures, for protection of the public, Owner, Contractor's employees, and existing construction to remain. Provide protective barriers indicated in the contract drawings.

3.2 EXISTING CONDITIONS

- A. Verify existing conditions in field and determine which affect plumbing work. Secure utilities as required to prevent spills, leakage, etc.
- B. Protect existing work to remain. Do not cut or remove any structural members.
- C. Rework existing services to remain which interfere with new work.

END OF SECTION 220010

SECTION 220020 - PLUMBING DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Selective plumbing demolition.
- B. Conform to the requirements of Division 01 for cutting and patching.
- C. Conform to the requirements of Division 02 for selective demolition.

1.2 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

1.3 DEFINITIONS

- A. Remove and Dispose: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

PART 2 - GENERAL

2.1 PATCHING MATERIALS

- A. As specified in individual Sections.
- B. Coordinate cutting and patching requirements.

PART 3 - GENERAL

3.1 PREPARATION

- A. Demolition Drawings are based on casual field observation. No record documents are available. Survey the affected areas before submitting bid proposal. Report discrepancies to the Architect/Engineer before disturbing the existing installation.
- B. Provide, erect, and maintain temporary dust screens, safeguards, barricades, signage and similar measures, for protection of the public, Owner, Contractor's employees, and existing construction to remain. Provide protective barriers indicated in the contract drawings.
- C. Protect existing materials and existing improvements which are not to be demolished.
- D. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.

3.2 DEMOLITION

- A. Disconnect, remove, cap, and identify plumbing work as indicated. Secure utilities as required to prevent spills, leakage, etc.
- B. Demolish in an orderly and careful manner. Protect existing work to remain. Do not cut or remove any structural members.
- C. Terminate all demolition work in a neat finished manner.
- D. Conceal or enclose abandoned work within building construction except as specifically noted.
- E. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- F. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

END OF SECTION 220020

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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. Metal pipe hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- D. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Install lateral bracing with pipe hangers and supports to prevent swaying.
- F. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

3.2 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.3 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 14. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 15. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 221413 - FACILITY STORM DRAINAGE PIPING

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. Hub-and-spigot, cast-iron soil pipe and fittings.
 - 2. Hubless, cast-iron soil pipe and fittings.
 - 3. Specialty pipe and fittings.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot head of water.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark and NSF certification mark.
 - 2. Class: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:

1. Standards: ASTM C 1277 and ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 2. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Install piping to allow application of insulation.
- I. Maintain swab in piping and pull past each joint as completed.
- J. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.
 - 1. Do not change direction of flow more than 90 degrees.
 - 2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- L. Install piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Storm Drainage Piping: 2 percent downward in direction of flow.
 - 3. Use a laser transit to measure inverts and slopes for underground piping.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- N. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.
 - a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
 - b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
 - 2. Install drains in storm drainage gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Joint Restraints and Sway Bracing:
 - 1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:
 - a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
 - b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
 - c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping.
 - 2. Install carbon-steel pipe support clamps for vertical piping.
 - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - 5. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
 - 1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
 - 2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."
- D. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.7 IDENTIFICATION

- A. Identify exposed storm drainage piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Test Procedure:
 - a. Test storm drainage piping on completion of roughing-in.
 - b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 5. Prepare reports for tests and required corrective action.

- C. Piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Completely rod and flush out all storm drainage.

3.10 PIPING SCHEDULE

- A. Aboveground storm drainage piping shall be the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings heavy-duty hubless-piping couplings; and coupled joints.
- B. Underground storm drainage piping shall be the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

END OF SECTION 221413

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

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. Metal roof drains.
 - 2. Metal terrace drains.
 - 3. Miscellaneous storm drainage piping specialties.
 - 4. Cleanouts.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

- A. Cast-Iron, General-Purpose Roof Drains: Refer to schedule on drawings.

2.2 METAL TERRACE DRAINS

- A. Cast-Iron, General-Purpose Terrace Drains: Refer to schedule on drawings.

2.3 CLEANOUTS

- A. Cast-Iron Exposed Cleanouts:
 - 1. Standard: ASME A112.36.2M.
 - 2. Size: Same as connected drainage piping
 - 3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 - 4. Closure: Countersunk or raised-head, brass plug.
 - 5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Cast-Iron Wall Cleanouts:
 - 1. Standard: ASME A112.36.2M. Include wall access.
 - 2. Size: Same as connected drainage piping.
 - 3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.

4. Closure Plug:
 - a. Brass.
 - b. Countersunk or raised head.
 - c. Drilled and threaded for cover attachment screw.
 - d. Size: Same as or not more than one size smaller than cleanout size.
5. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 2. Install expansion joints, if indicated, in roof drain outlets.
 3. Position roof drains for easy access and maintenance.
- B. Install terrace drains at low points of terrace areas.
 1. Install flashing collar or flange of terrace drain to prevent leakage between drain and adjoining deck. Maintain integrity of waterproof membranes where penetrated.
 2. Install expansion joints, if indicated, in terrace drain outlets.
 3. Position terrace drains for easy access and maintenance.
- C. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:
 1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
 3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate cleanouts at base of each vertical storm piping conductor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

- A. Install per roof manufacturer's guidelines.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

SECTION 230000 - GENERAL MECHANICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work shall include furnishing, installing and testing the equipment and materials specified in other sections of the Mechanical Specifications and shown on the Drawings. It is the intent of these Specifications that the mechanical systems shall be suitable in every way for the intended usage. All material and all work which may be reasonably implied as being incidental to the work of this Division shall be furnished at no extra cost.
- B. Division 01 Specifications Sections bound herewith are a component part of Division 23 specifications. Comply with all provisions, details and instructions of these sections in the accomplishment of work covered under Division 23.
- C. Furnish all labor, materials and equipment and incidentals required to make ready for use complete mechanical systems as shown on the Drawings and specified herein.
- D. Where Sub-Contracts are used to perform portions of the work, division of labor between sub trades is the responsibility of the Contractor.
- E. The general scope work includes, but is not limited to, furnishing, coordinating, and installing the following:
 - 1. Heating, air conditioning and ventilation equipment.
 - 2. Ductwork, air distribution.
 - 3. HVAC piping, specialties and equipment.
 - 4. Controls and wiring.
 - 5. Testing and balancing.
- F. Visit all areas of the site in which work under these sections is to be performed. Inspect carefully the existing conditions prior to bidding. Bid submission is evidence that the Contractor has examined the site and existing conditions, understands conditions under which the work will be performed, and takes full responsibility for complete knowledge of all factors governing the work.
- G. Schedule all service interruptions in existing facilities at the Owner's convenience with 24 hours (minimum) notice. Obtain prior approval for each interruption.
- H. Thoroughly test all mechanical systems at the completion of work and make any minor correction changes or adjustments necessary for all the proper functioning of the system and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.

1.2 SUBMITTALS

- A. Procedures for submittals: Submit under provisions of relevant sections of Division 01 Specifications Sections.
- B. Transmit each shop drawing submittal with provided Shop Drawing Submittal Cover Form, attached as Appendix B, for each item of equipment/material or each specification section/paragraph
- C. Clearly indicate proposed equipment and/or materials substitutions in shop drawings. Summarize all deviations from the specified quality, functionality, appearance or performance of proposed equipment and/or materials in the preface of each submittal. Include documentation to support deviations.

- D. Provide descriptive data on all materials and equipment as required to ascertain compliance with Specifications.
- E. Design layout shown on drawings is based on physical sizes of reputable equipment manufacturers. If equipment other than models indicated is installed, any resulting conflicts with space, maintenance access, clearances or codes are the responsibility of the Contractor to correct at his expense.
- F. Where specific models and manufacturers of materials and equipment are specified, substitutions as allowed by the specifications and State law will be considered. Substitutions must be equivalent in quality, function, suitability and arrangement to specified equipment. Architect/Engineer to have final authority as to equivalency of substitutions.
- G. Equipment model numbers noted in these specifications or on the drawings are intended to establish a minimum standard of quality and do not necessarily relate to specific options or arrangement as shown. Provide equipment with all standard features and optional features as stated and arranged as shown on the drawings.

1.3 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable state and local codes, standards and regulations.
- B. Furnish all materials and labor which is be required for compliance with codes, standards and regulations, whether specifically mentioned in these specifications or shown on the drawings.
- C. Obtain required construction permit from the authority having jurisdiction and arrange, at the proper time, for all inspections required by such authority. Pay all permit and inspection costs required.

1.4 COORDINATION OF WORK

- A. Contractor is responsible for coordination of work between trades. Provide fully complete and functional systems.
- B. Compare mechanical drawings and specifications with the drawings and specifications for other trades.
- C. Coordinate mechanical installation with the work of other trades. Report any pertinent discrepancies to the Architect/Engineer and obtain written instructions for any necessary revisions. Before starting any construction, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. No extras will be allowed for rework of uncoordinated installations.
- D. Determine exact route and location of each mechanical item prior to fabrication and/or installation. Adjust location of ducts, piping and equipment, etc., to accommodate interferences anticipated and encountered.
- E. Right of Way: General priority for right of way is as follows:
 - 1. Items located per regulatory requirement.
 - 2. Piping with pitch requirement (plumbing drains, etc.).
 - 3. Ductwork.
 - 4. Piping without pitch requirement.
 - 5. Electrical wiring (conduits, etc.).
- F. Arrange all work to permit removal (without damage to other parts) of any equipment requiring periodic replacement.

- G. Provide clearance and easy access to any equipment which requires periodic maintenance. Arrange ducts, piping and equipment to permit ready access to valves, starters, motors, control components, etc., and to clear the opening of swinging doors and access panels.

1.5 EQUIPMENT AND MATERIALS (GENERAL)

- A. Provide all new materials unless specifically indicated otherwise.
- B. Manufacturers and models listed in drawings and specifications are used for layout and to convey to bidders the general style, type, character and quality of product desired. Listed examples are used only to denote the quality standard of product desired and are not intended to restrict bidders to a specific brand, make, manufacturer or specific name.
- C. Adjust layout, system connections and coordinate with other trades as required to properly install equivalent products.
- D. Where equivalent products are submitted, include all associated costs related to substitution in bid.
- E. Furnish materials bearing the manufacturer's name and trade name. Provide UL label where a UL standard has been established for the particular material.
- F. Furnish standard products of manufacturers regularly engaged in production of equipment types required for the work. Use the manufacturer's latest approved design.
- G. Use the same manufacturer for equipment and materials of the same general type throughout the work to obtain uniform appearance, operation and maintenance.
- H. Protect equipment and materials from dirt, water, chemical or mechanical injury and theft at all times during construction. Provide covers or shelter as required.
- I. If materials or equipment are damaged at any time prior to final acceptance of the work, repair such damage at no additional cost. If materials or equipment are damaged by water, provide replacement no additional cost.
- J. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Notify the Architect/Engineer in writing of any conflicts between any requirements of the contract documents and manufacturer's directions. Obtain written instructions before proceeding with the work. The Contractor is responsible for correction of any work that does not comply with the manufacturer's directions or written instructions from the Architect/Engineer at no additional cost.
- K. Repair any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. Repaint entire damaged panel or section.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Refer to individual mechanical sections and Division 01.

1.7 PAINTING

- A. Protect sensors, controllers, etc. against painting. Do not install thermostats, devices or trim until painting is complete.

1.8 LOCATIONS AND MEASUREMENTS

- A. Location of mechanical work is shown on the drawings as accurately as possible. Field verify all measurements to ensure that the work suits the surrounding structure, trim, finishes and/or construction. Provide adjustment as necessary.
- B. Make minor relocations of work prior to installation as required or as directed by the Architect/Engineer at no additional cost.

1.9 SUPERVISION

- A. Contractor to provide an authorized and competent representative to constantly supervise the work from the beginning to completion and final acceptance. Insofar as possible, keep the same foreman and workmen throughout the project duration.
- B. Representatives of Architect/Engineer, Owner, and inspection authorities will make inspections during the progress of the work. Contractor to accommodate such inspections and correct deficiencies noted.

1.10 QUALITY AND WORKMANSHIP

- A. Contractor to employ skilled tradesmen, laborers and supervisors. Final product to present a neat, well finished, and professional installation.
- B. Remove and replace any work considered substandard quality in the judgment of the Architect/Engineer.

1.11 CLOSING IN WORK

- A. Do not cover up or enclose work until it has been inspected, tested and approved by authorities having jurisdiction over the work. Uncover any such work for inspection and/or test at no additional cost. Restore the work to its original condition after inspection and/or test at no additional cost.

1.12 CUTTING AND PATCHING

- A. Perform all cutting and patching necessary to install work under this Division.
- B. Perform cutting and patching in professional, workmanlike manner.
- C. Arrange work to minimize cutting and patching.
- D. Do not cut joists, beams, girders, columns or any other structural members without written permission from the Architect/Engineer.
- E. Cut opening only large enough to allow easy installation of piping, wiring or ductwork.
- F. Patching material to match material removed.
- G. Restore patched surface to its original appearance at completion of patching.
- H. Where waterproofed surfaces are patched, maintain integrity of waterproofing.
- I. Remove rubble and excess patching materials from the premises.

1.13 INTERPRETATION OF DRAWINGS

- A. Drawings and specifications under this Division are complementary each to the other. Provide any work specified herein and/or indicated on the drawings.
- B. Drawings are diagrammatic and indicate generally the location of fixtures, piping, devices, equipment, etc. Follow drawings as closely as possible, but arrange work to suit the finished surroundings and/or trim.
- C. The words “furnish”, “provide”, and/or “install” as used in these drawings and specifications are interpreted to include all material and labor necessary to complete the particular item, system, equipment, etc.
- D. Any omissions from either the drawings or specifications are unintentional. Contractor is responsible for notifying the Architect/Engineer of any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

1.14 ACCESSIBILITY

- A. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment to include, but not be limited to, valves, motors, controllers, and dampers. If required for accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility. Lack of access doors on drawings does not relieve Contractor of responsibility to provide access doors, if needed to properly service equipment.
- B. Coordinate exact locations and size of access panels for each concealed device requiring service.
- C. Coordinate access panel locations with architectural construction.
- D. Access panels are not required for access to work located above a lift-out “T” bar type ceiling.

1.15 ELECTRICAL WORK IN CONNECTION WITH MECHANICAL CONTRACTS

- A. Comply with Division 26. Any required Division 23 electrical work not specifically specified to be furnished by Division 26 Contractor shall be provided by Division 23 Contractor.
- B. All electrical work performed Division 23 shall comply with Division 26 specification requirements.
- C. Coordinate electrical interface of supplied mechanical equipment with electrical system. Division 26 electrical work for mechanical systems is based on values scheduled on mechanical drawings. Division 23 Contractor is responsible for any costs to modify the contracted electrical work to service equipment with electrical characteristics different than those scheduled.
- D. Under Division 26, power wiring shall be provided up to a termination point consisting of a junction box, trough, starter, VFD or disconnect switch. Under Division 26 line-side terminations shall be provided. Wiring from the termination point to the mechanical equipment, including final connections, shall be provided under Division 23.
- E. VFD Cable shall be 3-phase, 3 ground, copper tape spiral shield, galvanized steel interlocked 7 Armor cable. To ensure system reliability, the cable shall be terminated in connector designed exclusively for ASD/VFD cable.
- F. Refer to diagram on drawing clarifying who is to provide and install the termination point, such as (trough, VFD, individual starter, disconnect switch, JB, --- etc.).

1.16 MECHANICAL WORK IN CONNECTION WITH OTHER CONTRACTS

- A. Provide mechanical services as required for items furnished by other contractors or vendors as shown on the Drawings. Actual requirements may vary from Drawings. Coordinate with equipment installed. Make final connections only after approval of the other contractor or vendor, in the contractor's or vendor's presence.

1.17 ALTERNATE BIDS

- A. Alternate Bids, IF ANY, are described in relevant sections of Division 01 Specification Sections.

1.18 PROJECT RECORD DRAWINGS

- A. Submit under provisions of relevant sections of Division 01 Specifications Sections.
- B. As the work progresses, legibly record all field changes on a set of project contract drawings, herein after called the "record drawings."
- C. Record drawings shall accurately show the installed condition of mechanical work.

1.19 PHASING OF THE WORK

- A. Schedule work in accordance with the relevant sections of Division 01 Specifications Sections.

1.20 PROJECT CLOSEOUT

- A. Submit under provisions of relevant sections of Division 01 Specifications Sections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230000

SECTION 230010 - EXISTING CONDITIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Procedures for mechanical work in existing building.

1.2 RELATED WORK

- A. Conform to the requirements of Division 1 for cutting and patching. Conform to the requirements of Division 2 and Section 230020 for demolition.
- B. Conduct work to minimize interference with adjacent and occupied building areas.
- C. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

- A. As specified in individual Sections.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate mechanical service interruptions with the Owner.
- B. Provide temporary and/or permanent mechanical as shown and/or as required by conditions to maintain existing systems in service during construction. Use hot-tapping valves if required.
- C. Existing Mechanical Systems: Maintain existing mechanical systems in service. Disable systems outside construction area only to make tie-ins or switchovers. Obtain permission from the Owner at least 24 hours before partially or completely disabling mechanical. Minimize duration. Make temporary connections as required to maintain service in areas adjacent to work area.
- D. Drawings are based on casual field observation and existing record documents. Survey the affected areas before submitting bid proposal. Report discrepancies to the Architect/Engineer before disturbing the existing installation.
- E. Field-verify existing conditions as related to interconnection of New Work. Determine exact methods of interface to obtain proper operation.
- F. Coordinate existing and New Work interface prior to beginning any work. Adjust work to suit existing conditions. Some deviations in plan layout vs. actual conditions should be expected.
- G. Provide, erect, and maintain temporary dust screens, safeguards, barricades, signage and similar measures, for protection of the public, Owner, Contractor's employees, and existing construction to remain. Provide protective barriers indicated in the contract drawings.

3.2 EXISTING CONDITIONS

- A. Verify existing conditions in field and determine which affect mechanical work. Secure utilities as required to prevent spills, leakage, etc.
- B. Protect existing work to remain. Do not cut or remove any structural members.
- C. Rework existing services to remain which interfere with new work.

END OF SECTION 230010

SECTION 230020 - MECHANICAL DEMOLITION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Selective mechanical demolition.
- B. Conform to the requirements of Division 01 for cutting and patching.
- C. Conform to the requirements of Division 02 for selective demolition

1.2 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

- A. As specified in individual Sections.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Demolition Drawings are based on casual field observation and existing record documents. Survey the affected areas before submitting bid proposal. Report discrepancies to the Architect/Engineer before disturbing the existing installation.

- B. Provide, erect, and maintain temporary dust screens, safeguards, barricades, signage and similar measures, for protection of the public, Owner, Contractor's employees, and existing construction to remain. Provide protective barriers indicated in the contract drawings.
- C. Protect existing materials and existing improvements which are not to be demolished.
- D. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.

3.2 DEMOLITION

- A. Demolish mechanical work as indicated. Secure utilities as required to prevent spills, leakage, etc.
- B. Demolish in an orderly and careful manner. Protect existing work to remain. Do not cut or remove any structural members.
- C. Terminate all demolition work in a neat finished manner.
- D. Conceal or enclose abandoned work within building construction except as specifically noted.
- E. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- F. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- G. Coordinate cutting and patching requirements.

END OF SECTION 230020

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Variable-air-volume systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. TAB: Testing, adjusting, and balancing.
- C. TABB: Testing, Adjusting, and Balancing Bureau.
- D. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.4 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.
- B. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Construction Manager.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance and in this Section."
 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP units).

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.

- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
- B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
 2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 3. Measure total system airflow. Adjust to within indicated airflow.
 4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
 5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
 6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
 - a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
 7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
 8. Record final fan-performance data.
- C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Balance variable-air-volume systems the same as described for constant-volume air systems.
 2. Set terminal units and supply fan at full-airflow condition.
 3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
 4. Readjust fan airflow for final maximum readings.
 5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
 6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.

7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
 8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
 - a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
- D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
 2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
 3. Set terminal units at full-airflow condition.
 4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
 5. Adjust terminal units for minimum airflow.
 6. Measure static pressure at the sensor.
 7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each electric heating coil:
 - 1. Nameplate data.
 - 2. Airflow.
 - 3. Entering- and leaving-air temperature at full load.
 - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 - 5. Calculated kilowatt at full load.
 - 6. Fuse or circuit-breaker rating for overload protection.
- B. Measure, adjust, and record the following data for each refrigerant coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.
 - 4. Air pressure drop.
 - 5. Refrigerant suction pressure and temperature.

3.9 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.

3.10 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

3.12 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, supply air.
2. Indoor, return air.

B. Related Sections:

1. Section 230719 "HVAC Piping Insulation."

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule" article for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

E. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

2.4 SEALANTS

- A. FSK Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

A. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030-inch-thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 PREPARATION

- #### A. Surface Preparation:
- Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.

- e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, supply and return air.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums and casings.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket or board, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Return-Air Duct and Plenum Insulation: Mineral-fiber blanket or board, 2 inches thick and 0.75-lb/cu. ft. nominal density.

END OF SECTION 230713

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant 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. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 3. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 4. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 5. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

- B. Building Attachments: Structural-steel fasteners appropriate for construction materials to which hangers are being attached.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 - 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
 - 6. Provide drainage and cleanup for wash-down procedures.
 - 7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.6 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 DUCT SCHEDULE

- A. Supply Ducts:
 - 1. Ducts Connected to Terminal Units:

- a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round: 24.
 2. Ducts Connected to Variable-Air-Volume Air-Handling Units <Insert equipment>:
 - a. Pressure Class: Positive 4-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round: 6.
- B. Return Ducts:
 1. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round: 24.
- C. Exhaust Ducts:
 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round: 24.
- D. Intermediate Reinforcement:
 1. Galvanized-Steel Ducts: Galvanized steel.
- E. Elbow Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- F. Branch Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 - 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Turning vanes.
 - 3. Flexible ducts.
 - 4. Duct accessory hardware.

1.2 ACTION SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.

- b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
- 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
- 5. Blade Axles: Galvanized steel.
- 6. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.

B. Damper Hardware:

- 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
- 2. Include center hole to suit damper operating-rod size.
- 3. Include elevated platform for insulated duct mounting.

2.4 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- C. Vane Construction: Single wall.

2.5 FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 210 deg F.
 - 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

2.6 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- F. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Diffusers, registers and grilles.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 DIFFUSERS, REGISTERS AND GRILLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings or comparable product by one of the following:
 - 1. Price Industries.
 - 2. METALAIRE, Inc.
 - 3. Titus.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 260500 - GENERAL ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Instructions to Bidders, General Conditions of the Contract, Supplementary General Conditions and Division 1 bound herewith are a component part of this Division of the specifications and shall apply to this Division with equal force and shall be consulted in detail for instructions pertaining to the work.
- B. Furnish all labor, materials and equipment and incidentals required to make ready for use complete electrical systems as shown on the Drawings and specified herein.
- C. It is the intent of these Specifications that the electrical systems shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this Division shall be furnished at no extra cost.
- D. The work shall include, but not be limited to, furnishing, coordinating, and installing the following:
 - 1. Electrical distribution system for power, lighting, receptacles and miscellaneous power as shown on the contract drawings.
 - 2. Electrical lighting systems as shown on the contract drawings, complete with indicated switching, circuiting, etc.
 - 3. Electrical receptacle systems as shown on the contract drawings.
 - 4. Grounding.
 - 5. Other special requirements and/or systems where shown.
- E. Each bidder (or Representative) shall, before preparing a proposal, visit all areas of the existing site. If the work includes demolition, restoration, renovation and/or addition; then existing buildings and structures should be carefully inspected. The submission of the proposal by this Bidder shall be considered evidence that the Bidder (or Representative) has visited the site and noted the locations and conditions under which the work will be performed and that the Bidder takes full responsibility for a complete knowledge of all factors governing the work.
- F. All power interruptions to existing equipment shall be at the Owner's convenience with 24 hours (minimum) notice. Each interruption shall have prior approval.
- G. The work shall include complete testing of all equipment and wiring at the completion of work and making any minor correction changes or adjustments necessary for all the proper functioning of the system and equipment. All work shall be of the highest quality; substandard work will be rejected.
- H. Field verify all existing underground electrical and mechanical piping.

1.2 SUBMITTALS

- A. Shop drawings shall be submitted for all equipment, apparatus, and other items as required by the Architect/Engineer. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Submittals are required for all materials shown in the individual specifications sections.
- C. Submittals are required for materials and specific methods used for penetrations of rated assemblies and for seismic restraints.

- D. All shop drawings and submittals shall be submitted at the same time. Partial shop drawing and submittals will be rejected and not processed. Materials, equipment and long lead items that require special handling, if identified and requested by the contractor, will be processed separately.
- E. Proposed equipment and/or materials substitutions shall be clearly indicated in shop drawings. All deviations from the specified quality, functionality, appearance or performance of the proposed equipment and/or materials shall be clearly summarized in the preface of each submittal.
- F. The project shall be bid based on the equipment listed in these specifications and on the drawings. After award of the Electrical Contract the Contractor may wish to substitute equipment other than that specified, subject to approval. The Electrical Contractor shall bear the "burden of proof" for demonstrating substitute equipment equivalency and suitability.
- G. The Electrical Contractor shall be required to replace installed "equivalent" equipment if the operation of this equipment does not meet the full design intent of the specified system.
- H. Physical size of equipment used in the design layout are those of reputable equipment manufacturers. The Contractor is responsible for providing equipment which will fit the space provided. If the Contractor elects to use other manufacturer's equipment, any resulting conflicts with space clearance or codes shall be the responsibility of the Contractor to correct at the Contractor's expense.
- I. The Contractor assumes all responsibility for providing code clearances. Submit a scale drawing of each electrical equipment room showing exact size and location of all proposed electrical equipment with code clearances and working space clearly indicated.

1.3 COORDINATION OF WORK

- A. It is understood and agreed that the Contractor is, by careful examination, satisfied as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The Contractor shall be held responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in the other Divisions of these Specifications. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.
- B. The Contractor shall compare the electrical drawings and specifications with the drawings and specifications for other trades, and shall report any discrepancies between them to the Architect/Engineer and obtain written instructions for changes necessary in the electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the Contractor shall make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. All changes required in the work of the Contractor caused by neglect to do so shall be made at the expense of the Contractor.
- C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each electrical raceway prior to make up and assembly.
 - 1. Right of Way: Lines which pitch shall have the right of way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.
 - 2. Offsets and changes in direction of electrical raceways shall be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The Contractor shall furnish and install elbows, pull boxes, etc., as required to affect these offsets, transitions, and changes in directions. Conflicts between electrical raceways, fixtures, etc., and ductwork or piping which cannot be resolved otherwise, will be resolved by the Architect/Engineer.

- D. Installation and Arrangements: The Contractor shall install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The Contractor shall arrange electrical raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging and overhead doors and of access panels.

1.4 EQUIPMENT AND MATERIALS (GENERAL)

- A. In compliance with North Carolina General Statute 133.3, the Architect/Engineer has, wherever possible, specified the required performance and design characteristics of all materials utilized in this construction. In some cases, it is impossible to specify the required performance and design characteristics and when this occurs the Architect/Engineer has specified three or more examples of equal design or equivalent design, establishing an acceptable range for items of equal or equivalent design. Cited examples are used only to denote the quality standard of product desired and do not restrict bidders to a specific brand, make, manufacturer or specific name and are used only to set forth and convey to bidders the general style, type, character and quality of product desired. Equivalent products will be acceptable.
- B. Substitution of materials, items, or equipment of equal or equivalent design shall be submitted to the Architect/Engineer for approval or disapproval. Equal or equivalent shall be interpreted to mean an item of material or equipment, similar to that named and which is suitable for the same use and capable of performing the same functions as that named, the Architect/Engineer being the judge of equality.
- C. The materials used in all systems shall be new, unused and as hereinafter specified and shall bear the manufacturer's name, trade name and third party testing agency label in every case where a standard has been established for the particular material. Equipment furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of the required type of equipment, and shall be the manufacturer's latest approved design. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for approval as required by the Architect/Engineer.
- D. Protection: Electrical equipment shall at all times during construction be adequately protected against damage. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry, permanent shelters. If an apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be replaced at no additional cost to the Owner. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect/Engineer. Damage or defects, developing before acceptance of the work shall be made good at the Contractor's expense.
- E. Any damage to factory applied paint finish shall be repaired using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted per the field painting specifications in Division 9, at no additional cost to the Owner.
- F. Where materials such as wiring devices and plates, fire alarm equipment, paging system components, etc. are specified to match existing, provide materials to match existing equipment in finish, color, capacity, ratings, operating characteristics, performance, etc.
- G. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect/Engineer until installed.
- H. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
- I. Manufacturer's directions shall be followed completely in the delivery, storage, protection, and installation of

all equipment and materials. The Contractor shall promptly notify the Architect/Engineer, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the Architect/Engineer's written instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's direction or such written instructions from the Architect/Engineer, the Contractor shall bear all costs arising in correcting the deficiencies.

1.5 OPERATION AND MAINTENANCE MANUALS

- A. Submit under relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. The Contractor shall provide two compilations of catalog data, bound in suitable loose leaf binders, for each manufactured item of equipment used in the electrical work. These shall be presented to the Architect/Engineer for transmittal to the Owner before the final inspection is made. Data shall include printed installation, operation and maintenance instructions for each item, indexed by product with heavy sheet dividers and tabs. All warranties shall be included with each item. Each manufacturer's name, address and telephone number shall be clearly indicated.
- C. Shop drawings with Architect/Engineer's "as noted" markings are not acceptable for the above. "Approved" shop drawings are acceptable if adequate information is contained therein. Generally, shop drawings alone are not adequate.

1.6 PAINTING

- A. All painting will be performed by the General Contractor for the project, unless specifically indicated otherwise.
- B. The Electrical Contractor shall clean all exposed electrical work for painting. Should the Electrical Contractor delay in installing exposed conduit and outlets until the General Contractor has begun painting, the Electrical Contractor shall be required to paint all exposed electrical work at the Electrical Contractor's own expense. Such painting will be accomplished in accordance with the detailed specifications for the Project.
- C. Conductors exposed in boxes and cabinets shall be protected against painting. Devices, cover plates, trims, etc., for panelboards and cabinets shall not be installed until painting has been completed.
- D. The Electrical Contractor shall be responsible for touch up painting that may be required for electrical material or apparatus furnished with factory applied finish.

1.7 LOCATIONS AND MEASUREMENTS

Outlets and appliances are shown and located on the drawings as accurately as possible. All measurements shall be verified on the project and in all cases the work shall suit the surrounding trim, finishes and/or construction. The locations of outlets for special appliances shall be installed so that when extended, they are flush with the finished wall or ceiling and permit the proper installation of fixtures and/or devices. Heights of all outlets shown on the drawings are approximate only. Slight relocations of outlets, devices and equipment shall be made by the Contractor as required or as directed by the Architect/Engineer at no additional cost to the Owner.

1.8 QUALITY OF WORK

All work shall be executed as required by this specification and the accompanying drawings and shall be done by skilled mechanics, and shall present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

1.9 SUPERVISION

- A. The Contractor shall personally, or through an authorized and competent representative, constantly supervise the work from the beginning to completion and final acceptance. So far as possible, the Contractor shall keep the same foreman and mechanics throughout the project duration.
- B. During the progress of the work it shall be subject to inspection by representatives of the Architect/Engineer, the Owner, and local inspection authorities, at which time the Contractor shall furnish such required information and data on the project as requested.
- C. The Electrical Contractor shall coordinate the electrical work with other Contractors and cooperate in the preparation and maintenance of a master schedule for the completion of the project.

1.10 CLOSING IN WORK

Work shall not be covered up or enclosed until it has been inspected, tested and approved by the authorities having jurisdiction over this work. Should any of the work be enclosed or covered up before such inspection and test, the Contractor shall uncover the work at the Contractor's expense; after it has been inspected, tested and approved, the Contractor shall restore the work to its original condition. The State Electrical Inspector at the State Construction Office shall be called for all inspections at 919-807-4111. Inspections shall be limited to Monday thru Friday unless specifically authorized by State Construction Office

1.11 REFERENCE STANDARDS

- A. All electrical equipment, materials, and installation shall be in accordance with the latest edition of the following codes and standards:
 - 1. American Association of Edison Illuminating Companies (AEIC)
 - 2. American National Standards Institute (ANSI)
 - 3. American Society for Testing and Materials (ASTM)
 - 4. Building Officials Code Administrators (BOCA)
 - 5. Institute of Electrical and Electronic Engineers (IEEE)
 - 6. Insulated Cable Engineers Association (ICEA)
 - 1. International Code Council (ICC)
 - 2. International Conference of Building Officials (ICBO)
 - 3. National Electrical Code (NEC) 2017 edition
 - 4. National Electrical Contractor's Association (NECA)
 - 5. National Electrical Installation Standards (NEIS)
 - 6. National Electrical Manufacturer's Association (NEMA)
 - 7. National Electrical Safety Code (NESC)
 - 8. National Fire Protection Association (NFPA)
 - 9. North Carolina Energy Conservation Code, 2018 (NCECC)
 - 10. North Carolina State Building Code (NCSBC)
 - 11. North Carolina Construction Manual with GS as listed (NCCM)
 - 12. Occupational Safety and Health Act (OSHA)
 - 13. Requirements of the Americans with Disabilities Act (ADA), latest edition.
 - 14. Underwriters Laboratories Inc (U.L.)
 - 15. Southern Building Code Congress International (SBCCI)
 - 16. Toxicity Characteristics Leaching Procedure (TCLP)
- B. All electrical equipment and material shall be listed by an approved third party testing agency approved by the NCBCC and shall bear the appropriate testing agency's listing mark or classification marking. Equipment, materials, etc. utilized not bearing a third party testing agency certification shall be field or factory third party testing agency certified prior to equipment acceptance and use.

- C. Where reference is made to one of the above standards, the revision in effect at the time of the bid opening shall apply.

1.12 ENCLOSURE TYPES

- A. Unless otherwise specified herein or shown on the Drawings, electrical enclosures shall have the following ratings:
 - 1. NEMA 1 for dry, indoor locations.
 - 2. NEMA 3R for outdoor locations, rooms below grade (including basements and buried vaults), "DAMP" and "WET" locations.
 - 3. NEMA 4X for locations subject to corrosion when specifically noted.

1.13 CORROSION PROTECTION

All equipment and hardware subject to exposure to the elements and/or not installed in a conditioned space shall be fabricated of non-metallic materials, hot dip galvanized after fabrication or stainless steel. The requirements of preceding section entitled "Delivery and Storage" shall be strictly followed. Touch up any scratched metallic surfaces immediately to prevent corrosion. Apply cold galvanizing compound to all galvanized surfaces damaged during installation, i.e., cutting, etc. Ferrous, rusted or corroded materials shall be replaced before final acceptance of the work.

1.14 CODES, INSPECTION AND FEES

- A. All equipment, materials and installation shall be in accordance with the requirements of the local authority having jurisdiction which is the State Construction Office.
- B. The Electrical Contractor shall obtain all necessary permits and inspections of electrical work.
- C. The Electrical Contractor shall contact State Construction Office Electrical to schedule any and all required inspections. All inspections shall be limited to Monday thru Friday unless specifically authorized by the State Construction Office.

1.15 TESTS AND SETTINGS

- A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.
- B. Make the following minimum tests and checks prior to energizing electrical equipment:
 - 1. Mechanical inspection, testing and settings of all circuit breakers, disconnect switches, motor starters, control equipment, etc., for proper operation.
 - 2. Check all wire and cable terminations. Verify to the Architect/Engineer that connections meet the equipment torque requirements.
 - 3. Check rotation of motors, obtain permission from other contractors to start motor, and proceed to check for proper rotation. If the motor rotates in the wrong direction, correct it. Take all necessary precautions not to damage any equipment.
 - 4. Provide all instruments and equipment for the tests specified herein.
- C. All testing shall be scheduled and coordinated by the Contractor. Notify the Owner at least two (2) weeks in advance of conducting tests. The Contractor shall have qualified personnel present during all testing.

- D. All tests shall be completely documented with the time of day, date, temperature, and all other pertinent test information. All required documentation of readings indicated shall be submitted to the Architect/Engineer prior to, and as one of the prerequisites for, final acceptance of the project.
- E. Electrical Distribution System Tests: All current carrying phase conductors and neutrals shall be tested as installed, and before load connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. The following procedures shall be as follows:
1. Minimum readings shall be one million (1,000,000) ohms or more for #6 AWG wire and smaller; 250,000 ohms or more for #4 AWG wire or larger. Measurement to be taken between conductors and between conductor and the grounded metal raceway.
 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 megger reading between the neutral bar and grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from this neutral bar. The Contractor shall then test each one separately to the panel until the low reading ones 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 Architect/Engineer, and to the North Carolina State Construction Office certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.
 4. At inspection, the Contractor shall furnish a megger and show Architect/Engineer's representative that the panels comply with the above requirements. The Contractor shall also furnish a clamp type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.
 5. At inspection, the Contractor shall furnish ladders, required tools, and mechanics to open fixtures, boxes, panels, or any other equipment to enable the Architect/Engineer's representatives to see into any parts of the installation that may be requested.
- F. Electrical Grounding System Tests: Provide documentation showing values of earth ground impedance for the system ground. See Specifications Section 260526 for testing requirements.

1.16 SLEEVES AND FORMS FOR OPENINGS

- A. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work shall be furnished, located and installed by the Electrical Contractor. The Electrical Contractor shall give sufficient information (marked and located) to the General Contractor in time for proper placement in the construction schedule. Should the Electrical Contractor delay or fail to provide sufficient information in time, then the Electrical Contractor shall cut and patch construction as necessary and required to install electrical work. Such cutting and patching will be done by the General Contractor but paid for by the Electrical Contractor.
- B. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.
- C. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, request shop drawings, equipment location drawings, foundation drawings, and any other data required to locate the concealed conduit before the floor slab is poured.
- D. Where such data is not available in time to avoid delay in scheduled floor slab pours, the Architect/Engineer may elect to allow the installations of such conduits to be exposed. No additional compensation for such change will be allowed and written approval must be obtained from the Architect/Engineer.
- E. Seal all openings, sleeves, penetration, and slots as specified and as shown on the Contract Drawings.

1.17 CUTTING AND PATCHING

- A. For the purposes of the Electrical Contract, "cutting and patching" shall be defined as that work required to introduce new electrical work into existing construction. Work required to install or fit electrical boxes, conduit, enclosures, equipment, etc. into new construction is not "cutting and patching".
- B. The Electrical Contractor shall perform all cutting and patching necessary to install all equipment as required under his contract and shall re-establish all finishes to their original condition where cutting and patching occur.
- C. All cutting and patching shall be done in a thoroughly workmanlike manner.
- D. Core drill holes in existing concrete floors and walls as required.
- E. Install work at such time as to require the minimum amount of cutting and patching.
- F. Do not cut joists, beams, girders, columns or any other structural members without first obtaining written permission from the Architect/Engineer.
- G. Cut opening only large enough to allow easy installation of the conduit.
- H. Patching is to be of the same kind of material as was removed.
- I. The completed patching work shall restore the surface to its original appearance.
- J. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.
- K. Remove rubble and excess patching materials from the premises.
- L. Raceways and ducts penetrating rated floor, ceiling or wall assemblies shall be properly sealed in accordance with the corresponding Underwriters Laboratories approved method utilizing approved and listed materials.

1.18 INTERPRETATION OF DRAWINGS

- A. The Electrical drawings and specifications are complementary each to the other and what may be called for by one shall be as binding as if called for by both. The drawings are diagrammatic and indicate generally the location of outlets, devices, equipment, wiring, etc. Drawings shall be followed as closely as possible; however, all work shall suit the finished surroundings and/or trim.
- B. Do not scale electrical drawings. Refer to the architectural drawings for dimensions.
- C. Where the words "furnish and install" or "provide" are used, it is intended that this contractor shall purchase and install completely any and/or all material necessary and required for this particular item, system, equipment, etc.
- D. Where the words "the Contractor" or "this Contractor" appear in either the Electrical Drawings or Division 26 Specifications, it shall mean the Electrical Contractor.
- E. Any omission from either the drawings or these specifications are unintentional, and it shall be the responsibility of this Contractor to call to the attention of the Architect/Engineer any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.
- F. Where no specific material or equipment type is mentioned, a high-quality product of a reputable manufacturer may be used provided it conforms to the requirements of these specifications. These materials

shall be listed or labeled by a Third-Party Testing Agency accredited by the NCBCB to label electrical equipment.

- G. The electrical drawings show the general arrangement of raceways, equipment, fixtures, and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. Some adjustment of routings and installation of conduit, cable tray and devices should be expected. The electrical work shall conform to the requirements shown on all of the drawings. General and Structural drawings shall take precedence over Electrical Drawings. Because of small scale of the electrical drawings, it is not possible to indicate offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings and accessories as may be required to meet such conditions, without additional cost to the Owner and as directed by the Architect/Engineer.
- H. Each 3-phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.
- I. Unless otherwise approved by the Architect/Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- J. Where circuits are shown as "home runs" all necessary fittings and boxes shall be provided for a complete raceway installation.
- K. Verify with the Architect/Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
- L. Any work installed contrary to or without approval by the Architect/Engineer shall be subject to change as directed by the Architect/Engineer, and no extra compensation will be allowed for making these changes.
- M. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Architect/Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Architect/Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- N. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.
- O. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of equipment.
- P. All connections to the equipment shall be made as required, and in accordance with the approved shop and setting drawings.
- Q. Redesign of electrical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at the Contractor's expense. Redesign and detailed plans shall be submitted to the Architect/Engineer for approval. No additional compensation will be provided for changes in the work, either the Electrical Contractor's or others, caused by such redesign.
- R. All floor mounted electrical equipment shall be placed on 4-inch thick concrete housekeeping pads. Edges shall be chamfered.

1.19 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his materials in sections sized to permit passing through such restricted areas in the structure.
- B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to suitably brace the equipment, to ensure that the tilting does not impair the functional integrity of the equipment.

1.20 RECORD DRAWINGS

- A. As the work progresses, legibly record all field changes on one set of project contract drawings, herein after called the "record drawings".
- B. Record drawings shall accurately show the installed condition of the following items:
 - 1. Panel schedule(s).
 - 2. Control wiring diagram(s).
 - 3. Lighting fixture schedule(s).
 - 4. Branch circuit conduit and conductor sizes.
 - 5. Lighting fixture, receptacle, and switch outlets, interconnections and homeruns with circuit identification.

1.21 SEISMIC REQUIREMENTS

- A. All equipment furnished under the electrical contract shall be installed in a manner to be fully compliant with the seismic restraint requirements of the North Carolina State Building Code (NCSBC). The Contractor shall provide any and all seismic restraint details and calculations that may be required by the NCSBC and/or the Authority Having Jurisdiction.
- B. Requirements for restraints are detailed in the NCSBC. All tables and references shall conform to building's location. Restraints shall be per Seismic Performance Category stated on Architectural Drawings and Structural Drawings.
- C. The Contractor shall retain the services of a Professional Engineer registered in the State of North Carolina to design seismic restraint elements required for this project. The Engineer's calculations, bearing his professional seal, shall accompany shop drawings and shall demonstrate Code compliance including certification that the seismic system components comply with the testing requirements of NCSBC Section 1708.5. Calculations and shop drawings shall be submitted for review prior to the purchasing of materials, equipment, systems and assemblies. Internal seismic restraint elements of manufactured equipment shall be certified by a professional engineer retained by the manufacturer. Such certificate applies only to internal elements of the equipment. All equipment anchorage requirements shall be coordinated with the building structure and shall be compatible thereto. All such anchorages shall be subject to the review and approval of the project's structural engineer.
- D. The Professional Engineer retained for seismic restraint calculations shall visit the job site upon completion of the seismic restraint installation to comply with the Special Inspections requirement of the Code. This engineer shall provide written verification of compliance of the installation with the approved seismic submittal. This verification shall be submitted as a Special Inspections Report and shall bear the Engineer's professional seal. Job site inspections by other than this engineer are not acceptable.
- E. Review of the seismic design computations and shop drawings by the Architect/Engineer or his agent shall not relieve the Contractor of his responsibility to comply with the seismic or any other requirements of the North Carolina State Building Code.

1.22 GUARANTEE

The Contractor shall guarantee the materials and workmanship covered by these drawings and specifications for a period of one year from the date of acceptance by the Owner. The Contractor shall repair and/or replace any parts of any system that may prove to be defective at no additional cost to the Owner within the guarantee period. All equipment warranties shall be as specified and included in the Contract Documents.

1.23 PHASING OF THE WORK

The Electrical Contractor shall schedule his work as described in the relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.

1.24 ALTERNATE BIDS

Alternate bid items are described in relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used.

END OF SECTION 260500

SECTION 260519 - BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Section 260533 - Conduit.
- B. Section 260534 - Boxes.
- C. Section 260553 - Identification.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NECA Standard of Installation (National Electrical Contractors Association).

1.4 SUBMITTALS

- A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, ratings, colors, and configurations.
- C. Test Reports: Indicate procedures and values obtained.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS

- A. All wire and cable shall be installed in conduit. This includes all power wiring; fire alarm, sound and communications wire and cable (unless noted otherwise); HVAC control cable; etc.
- B. Verify that field measurements are as shown on Drawings.
- C. Conductor sizes are based on 75° C. copper.
- D. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- E. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

- A. Coordinate Work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

PART 2 - PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. Description: Single conductor insulated building wire.
- B. Conductor: Copper. Solid and stranded as specified below. Minimum #12 AWG, maximum 500 KCMil.
- C. Insulation/Voltage Rating: 600 volts.
- D. Insulation: Dual-rated THHN/THWN or XHHW.
- E. Color Coding:

	120/240 volts <u>and 208/120 volts</u>	<u>480/277 volts</u>
Phase A -	Black	Brown
Phase B -	Red	Orange
Phase C -	Blue	Yellow
Neutral -	White	Gray
Ground -	Green	Green

2.2 WIRING CONNECTORS AND CONNECTIONS

- A. Conductors shall be installed continuous from outlet to outlet with no splicing except within outlet or junction boxes, troughs and gutters. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- B. Use mechanical connectors for copper conductor splices and taps, 8 AWG and larger, except main grounding conductors, which shall be terminated with compression lugs. Tape un-insulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor or use UL-approved insulating covers.

- C. Use insulated spring wire connectors with plastic caps for copper conductors, 10 AWG and smaller, splices and taps in junction boxes, outlet boxes and lighting fixtures, Ideal "wirenuts" or 3M Company "Scotchlock". "Push wire" type connectors are not acceptable.
- D. "Sta-Kon" or other permanent type crimp connectors shall not be used for branch circuit connections.
- E. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire has been completed.
- C. Verify that raceway installation is complete and supported.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

- A. Concealed Dry Interior Locations: Use only building wire in raceway.
- B. Exposed Dry Interior Locations: Use only building wire in raceway.
- C. Above Accessible Ceilings: Use only building wire in raceway.
- D. Wet or Damp Interior Locations: Use only building wire in raceway.
- E. Underground Installations: Use only building wire in raceway

3.4 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Route wire and cable as required to meet Project Conditions.
- C. Install cable in accordance with the NECA "Standard of Installation".
- D. Use solid conductor for feeders and branch circuits 10 AWG and smaller, and Class B stranded for larger conductors.
- E. Use conductor not smaller than 12 AWG for power and lighting circuits.
- F. Use conductor not smaller than 14 AWG for fire alarm and control circuits.

- G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet or branch circuit homeruns longer than 50 feet.
- H. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet or branch circuit homeruns longer than 125 feet.
- I. Pull all conductors into raceway at same time.
- J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- K. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- L. Clean conductor surfaces before installing lugs and connectors.
- M. Identify wire and cable under provisions of Section 260553.
- N. Identify each conductor with its circuit number or other designation indicated on Drawings.
- O. Common neutral multiwire receptacle branch circuits are not permitted. Provide separate, individual neutral conductors for receptacle circuits.

3.5 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Inspect wire for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Verify continuity of each branch circuit conductor.
- E. Prior to energizing, feeders, sub-feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests shall be sent to the North Carolina State Construction Office through the Architect.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Equipment grounding conductors.

1.2 REFERENCES

- A. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- C. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS FOR REVIEW

- A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide for grounding electrodes and connections.

1.4 SUBMITTALS FOR INFORMATION

- A. Submittals: Submittals for information. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Test Reports: Indicates overall resistance to ground and resistance of each electrode.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 SUBMITTALS FOR CLOSEOUT

- A. Contract Closeout: Procedures for submittals as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Project Record Documents: Record actual locations of components and grounding electrodes.
- C. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MECHANICAL CONNECTORS

- A. Material: Cast bronze, brass, or plain malleable iron. Ground clamps shall not be fabricated from aluminum or any aluminum alloy.

2.2 WIRE

- A. Material: Stranded copper sized per NEC requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordination and Meetings: Verify existing conditions prior to beginning work as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

3.2 INSTALLATION

- A. Quality Control: Manufacturer's instructions shall be followed as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Provide bonding to meet Regulatory Requirements.
- C. Provide separate, insulated conductor within each feeder and branch circuit raceway.
- D. Equipment Grounding Conductor: The raceway system shall not be relied on for ground continuity. A green grounding conductor, properly sized per the NEC (Table 250-122) shall be run in all raceways. Terminate each end on suitable lug, bus, or bushing. Exceptions are as follows:
 - 1. Raceways for telecommunications.
 - 2. Raceways for data.
 - 3. Raceways for audio conductors.
 - 4. Services.
- E. Equipment grounding continuity shall be maintained through flexible conduit as required in previous sections.
- F. Grounding conductors shall be installed as to permit the shortest and most direct path from equipment to ground. All connections to ground conductors shall be accessible for inspection and made with approved solderless connectors, brazed or bolted to the equipment or structure to be grounded. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal to metal contact.
- G. All equipment housings and/or enclosures, and all non-current carrying metallic parts of electrical equipment, raceway systems, etc., shall be effectively and adequately bonded to ground.

- H. Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per the NEC and lugged to the box.
- I. An equipment ground bus shall be installed in each panelboard for terminating equipment grounding conductors.
- J. All wiring devices equipped with grounding connections shall be permanently and securely connected to the enclosure in which they are mounted with a copper grounding jumper.
- K. The frame of all lighting fixtures shall be securely grounded to the equipment ground system with grounding conductors.

3.3 FIELD QUALITY CONTROL

- A. Quality Assurance: Field inspection, testing and adjusting as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Inspect and test in accordance with NETA ATS, except Section 4, or provide for qualified technicians to perform testing according to the manufacturer's recommendations.

END OF SECTION 260526

SECTION 260529 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 REFERENCES

- A. NECA - National Electrical Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance. See Specifications Section 260500, Para. 1.13 for additional hardware corrosion resistance requirements.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use expansion anchors.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts.
 - 5. Solid Masonry Walls: Use expansion anchors.

- 6. Sheet Metal: Use sheet metal screws or bolts
- 7. Wood Elements: Use wood screws.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use powder-actuated anchors.
- E. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- I. Conduits installed on the interior of exterior building walls shall be spaced away from the wall surface a minimum of 1/4 inch using "clamp-backs" or struts.
- J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetallic conduit.
- F. Surface Raceway

1.2 RELATED SECTIONS

- A. Division 7: Fire Stopping.
- B. Section 260534 - Boxes.
- C. Section 260526 - Grounding and Bonding.
- D. Section 260529 - Supporting Devices.
- E. Section 260553 - Electrical Identification.

1.3 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NECA "Standard of Installation".
- F. NEMA TC2 - Schedule 40 PVC
- G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.5 SUBMITTALS

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings and conduit bodies.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Accurately record actual routing of conduits larger than 2 inches.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.9 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Size: Conduit shall be sized in accordance with the latest edition of the NEC unless shown otherwise, with minimum conduit size being 1/2 inch, except homeruns minimum size shall be 3/4". Flexible metal and watertight ("sealtite") conduit in size 1/2 inch and larger are acceptable for motor, appliance and fixture connections provided green ground wire is installed (see Section 260526) and NEC is followed.

- B. All conduit will be provided with insulated throat.
- C. Underground Installations:
 - 1. More than Five Feet from Foundation Wall: Use rigid steel conduit, intermediate metal conduit, plastic coated conduit, thickwall nonmetallic conduit and thinwall nonmetallic conduit.
 - 2. Within Five Feet from Foundation Wall: Use rigid steel conduit.
 - 3. In or Under Slab on Grade: Use rigid steel conduit, intermediate metal conduit, plastic coated conduit, thickwall nonmetallic conduit and thinwall nonmetallic conduit.
 - 4. Minimum Size: 1 inch.
- D. Outdoor Locations, Above Grade: Use rigid steel conduit.
- E. In Slab Above Grade:
 - 1. Use rigid steel conduit.
 - 2. Maximum Size Conduit in Slab: 3/4 inch.
- F. Wet and Damp Locations: Use rigid steel conduit.
- G. Interior Dry Locations:
 - 1. Concealed: Use rigid steel conduit, intermediate metal conduit or electrical metallic tubing. EMT may be utilized as permitted by the NEC, with the following restrictions. EMT shall not be installed:
 - a. where tubing, couplings, elbows and fittings would be in direct contact with the earth.
 - b. underground (in/below slab-on-grade or in earth).
 - c. any location outdoors where the tubing, etc., would be subjected to the elements.
 - d. where subject to severe corrosive influence.
 - e. where subject to severe physical damage.
 - 2. Exposed: Use rigid steel conduit, intermediate metal conduit or EMT where not subject to damage.
 - 3. Finished Areas: Surface Metal Raceway

2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Plastic-Coated Rigid Steel Conduit: ANSI C80.1, 40 mil PVC coating.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit with all steel fittings.

2.3 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction.
- B. Fittings: ANSI/NEMA FB 1, steel.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction with PVC jacket.

- B. Fittings: ANSI/NEMA FB 1, steel or nonmetallic type.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression type, insulated throat.

2.6 NONMETALLIC CONDUIT

- A. Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 ONE PIECE SURFACE METAL RACEWAY

- A. The raceway shall be dual channel (one side for power and one side for data) with a base and cover factory assembled.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.
- C. A hand operated cutting tool shall be available for the base and cover to ensure clean, square cuts.
- D. A full complement of fittings shall be available including but not limited to mounting clips and straps, couplings, flat, internal and external elbows, cover clips, tees, entrance fittings, conduit connectors and bushings. The covers shall be painted with an enamel finish, in to match the raceway. They shall overlap the raceway to hide uneven cuts. All fittings shall be supplied with a base where applicable.
- E. Device boxes shall be available for mounting standard devices and faceplates. A device box shall be available in single- and multiple-gang configurations up to six-gang. They shall range in depth from 0.94" to 2.75". Single-gang boxes shall allow for snap-on and fastener application. Extension boxes shall be available to adapt to existing standard flush switch and receptacle boxes. All device and fixture box covers shall be painted with an enamel finish, ivory in color to match the raceway cover.
- F. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP/STP Fiber Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons as well as write-on station identification labels shall be available.
- G. Raceway shall be paintable to match adjacent colors.
- H. Raceway shall be painted by Electrical Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Circuiting is shown schematically. Exact routing of branch circuits may be varied to suit building construction; however, the combination of circuits within raceways and panelboard connections shall not be changed from those shown on the drawings.

- B. Raceways shall be installed concealed in finished areas. Where construction does not permit concealed raceways and where indicated on the drawings, raceways shall be run exposed. Exposed raceways shall be run parallel to, or at a right angle with the building walls. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- C. Where any run of rigid conduit may change to a run of EMT or vice-versa, each change shall be made in a junction or outlet box with each conduit terminated separately therein. Rigid conduit to EMT (or vice-versa) adapters shall not be permitted.
- D. Install conduit in accordance with NECA "Standard of Installation".
- E. Arrange conduit to maintain headroom and present neat appearance.
- F. Maintain adequate clearance between conduit and piping.
- G. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- H. Cut conduit square using saw or pipecutter and de-burr cut ends.
- I. Bring conduit to shoulder of fittings; fasten securely.
- J. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- K. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows, or hydraulic one-shot bender, to fabricate bends in metal conduit larger than 2 inch size.
- L. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- M. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control and expansion joints.
- N. Provide suitable pull string in each empty conduit except sleeves and nipples.
- O. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- P. The raceway system shall not be relied on for grounding continuity. Ground and bond conduit under provisions of Section 260526.
- Q. Identify conduit under provisions of Section 260553.
- R. The use of "LB's" shall be limited where possible. Where necessary to use "LB's" sized above 2 inch, mogul units shall be installed.
- S. Where concentric, eccentric or over-sized knockouts are encountered, a grounding type insulated bushing shall be provided.
- T. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- U. Arrange supports to prevent misalignment during wiring installation.
- V. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

- W. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- X. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- Y. Do not attach conduit to ceiling support wires.
- Z. All metallic raceways entering or leaving panelboards (branch circuits less than 30 amperes in lighting and appliance branch circuit panelboards excepted), switchboards, transfer switches, enclosed circuit breakers, safety switches, transformers, etc. shall be provided with insulated grounding and bonding bushings and each separate piece of raceway shall be individually bonded to the equipment ground bus or metallic enclosure, as applicable, by means of copper conductor sized in accordance with the National Electrical Code.
- AA. The term “fittings” includes couplings, connectors, offsets, LBs, etc.
- BB. No pressure cast (pot metal) fittings or conduit bodies shall be allowed.
- CC. Outlets, junction, taps, etc., on exposed rigid metal conduit shall be cast metal conduit fittings or cast metal boxes of the type and size appropriate for the location. Sheet steel outlet boxes shall not be permitted on exposed raceway runs except at or near a ceiling for interior construction.
- DD. EMT couplings and terminations shall be made utilizing steel-plated hexagonal compression connectors. No set screw or indented type fittings shall be utilized.
- EE. EMT couplings and terminations shall be “concrete tight” where buried in masonry or concrete. EMT fittings, where installed in damp locations, shall be of the “raintight” type.
- FF. Install nonmetallic conduit in accordance with manufacturer’s instructions.
- GG. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- HH. PVC schedule 40 shall not be used exposed or concealed in gypsum walls, but may be used in CMU walls.
- II. IMC and GRC shall terminate with either a double locknut / bushing set, or in a threaded hub.
- JJ. Conduit couplings for IMC, GRC and PVC shall be in accordance with the NEC.
- KK. The placement of conduit in floor slabs shall be thoroughly coordinated with the General Contractor to avoid conflicts with steel reinforcing bars, reductions in net concrete sections and floor penetrations.
- LL. Route conduit under slab from point-to-point.
- MM. Where underground or underslab 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 plastic -coated rigid steel.
- NN. 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.
- OO. Service entrance raceways run inside building foundation walls shall be buried at least eighteen (18) inches below grade or encased with a minimum of two (2) inches of concrete on all sides. Concrete encasement shall extend to the service equipment for raceways exposed above grade in crawl spaces.

- PP. Encased raceways shall be of a type approved by the NEC as “suitable for concrete encasement”.
- QQ. Encased raceways shall have a minimum cover of eighteen (18) inches, except for raceways containing circuits with voltages above 600 volts, which shall have a minimum cover of thirty (30) inches.
- RR. 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.
- SS. Raceways run underground, internal to building foundation walls shall be of a type, and installed by a method approved by the NEC.
- TT. Raceways that penetrate outside walls, ceilings from conditioned space or other similar condition shall be effectively sealed to prevent condensation from infiltrating humid air.
- UU. Where raceways pass through a below grade wall, from a conditioned interior building space, the raceway shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type “FSK” thru-wall fitting with “FSKA” membrane clamp adapter if required.
- VV. All underground raceways shall be identified by underground line marking tape within the provisions of Section 260553. The tape to be located directly above the raceway and 6 to 8 inches below finished grade.
- WW. EMT conduit provided below roof deck shall be installed 1-1/2 inches away from the deck to allow for screws not to penetrate the EMT conduit during reroofing.
- XX. Conduits, JB's, Troughs, any enclosure when mounted outside on the walls, shall be off the walls by one inch.
- YY. Surface metal raceways shall be used only where indicated on the drawings. All hardware and supports shall be per NEC and supplied by with raceway.
- ZZ. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 7.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified under Division 7.

END OF SECTION 260533

SECTION 260534 - BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 RELATED SECTIONS

- A. Division 7: Firestopping.
- B. Division 8: Access Doors.
- C. Section 262726 - Wiring Devices: Wall plates in finished areas.
- D. Section 260529 - Supporting Devices.

1.3 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide manufacturer's catalog information showing dimensions and configurations.

1.5 SUBMITTALS FOR CLOSEOUT

- A. Contract Closeout: Submittals for Project closeout. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes (for interior conditioned spaces only): NEMA OS 1, galvanized steel.
 - 1. Junction, switch, receptacle and outlet boxes for interior use in dry locations shall be zinc coated or cadmium plated sheet steel, 4" square and 2-1/8" deep, unless otherwise indicated on the contract drawings. Smaller and shallower outlet boxes will be permitted only by special permission of the Architect/Engineer where such boxes are necessary due to structural conditions encountered. Where larger junction boxes are required, they shall be fabricated from No. 10, 12, 14 or 16 gauge sheet steel as required by the Underwriters Laboratories, Inc., and galvanized after fabrication. All junction boxes shall have screw fastened covers. Outlet boxes shall be provided with extension plaster rings where required by structural and finish conditions. Sheet steel boxes shall be as manufactured by Appleton, Raco, Steel City or Spring City.
 - 2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 2 inch male fixture studs where required.
 - 3. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes (for all exterior and exposed unconditioned spaces): NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs. Cast boxes shall be by Crouse-Hinds, Appleton, O. Z. Gedney or Killark.
- C. Wall Plates for Finished Areas: As specified in Section 262726.

2.2 PULL AND JUNCTION BOXES

Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify locations of outlets prior to rough-in.

3.2 INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation".
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights indicated and specified in section for outlet device. Boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes. Use flush mounting outlet box in finished areas. Use stamped steel bridges to fasten flush mounting outlet box between studs.

3.3 ADJUSTING

- A. Contract Closeout: Adjust installed work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

3.4 CLEANING

- A. Contract Closeout: Clean installed work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION 260534

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Wiring device plates marking.

1.2 RELATED SECTIONS

Division 9: Painting.

1.3 REFERENCES

ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic as follows:

Furnish and install engraved laminated phenolic nameplates for all electrical equipment supplied under this contract for identification of system, equipment controlled or served, phase, voltage, ampacity, etc. Nameplates shall be securely attached to equipment with stainless steel screws, and shall identify by name the equipment controlled, attached, etc. Embossed, self adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:

1. Blue surface with white core for all 120/208 volt equipment.
2. Black surface with white core for 277/480 volt 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.
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.

B. Locations:

1. Each electrical distribution and control equipment enclosure (safety switches, panelboards, transformers, etc.)
2. Communication cabinets.
3. Pull and splice boxes.

C. Letter Size: Letters shall be a minimum of 1/2 inch high.

2.2 WIRE MARKERS

A. Description: Split sleeve type wire markers or approved equivalent.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on drawings.
2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams on drawings.

2.3 CONDUIT, RACEWAY AND BOX MARKING

Paint visible surfaces of exposed junction and outlet boxes and covers of raceway systems above lay-in and other accessible ceilings. Paint all boxes and covers before installation. Paint exposed conduit and raceways at ten foot minimum intervals with a 6 inch wide band in accordance with the color scheme outlined above. Mark conduits at junction boxes above accessible ceilings with the panelboard and circuit numbers of the circuits contained in the raceway using a permanent black marking pen.

2.4 WIRING DEVICE PLATES MARKING

A. Description:

1. Adhesive backed, laminated plastic receptacle device plate labels identifying the circuit feeding the device. Labels shall be label machine printed, black lettering on a clear background, to indicate panel and circuit number and shall be Casio, Brother, T&B or approved equal.
2. Print circuit number on flag type plastic cable tie with a permanent marker (Sharpie, etc.) and attach to conductors in outlet box. Flag shall be readily visible upon removal of device plate.

B. Locations: Each receptacle device plate. Apply centered on the lower portion below the receptacle, parallel to the lower surface.

C. Legend: Typed labels to indicate panel and circuit number feeding the device (i.e., RPA-24).

PART 3 - EXECUTION

3.1 PREPARATION

Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplate parallel to equipment lines.
- B. Secure nameplate to equipment front using self tapping stainless steel screws, lockwashers and acorn nuts as shown on the Drawings.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Install receptacle identification labels at top of each device plate, parallel to upper surface.
- E. Identify conduit using field painting under provisions of Division 9.
- F. 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.
- G. Update all existing panelboard directories where changes are made. Provide new panel schedule cards as required to maintain legibility.
- H. Install adhesive backed labels and nameplates only when ambient temperature and humidity conditions for adhesive use are within range recommended by manufacturer.

END OF SECTION 260553

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall box dimmers.
- C. Receptacles.
- D. Wall plates.

1.2 DESCRIPTION

- A. Provide wiring devices in types, characteristics, grades, colors and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL, NEMA and DSCC (Fed Spec) standards.

1.3 RELATED SECTIONS

- A. Section 260534 - Boxes.

1.4 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA WD 1 - General Requirements for Wiring Devices.
- C. NEMA WD 6 - Wiring Device - Dimensional Requirements.
- D. NFPA 70 - National Electrical Code.
- E. Underwriters Laboratories (UL 20, 244A, 498, 514C, 1472).
- F. DSCC (Fed Spec) W-C-596G

1.5 SUBMITTALS FOR REVIEW

- A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.6 SUBMITTALS FOR INFORMATION

- A. Submittals: Submittals for information. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Submit manufacturer's wiring and installation instructions.

- C. Product Data: Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

1.8 WARRANTY

- A. Provide manufacturer's full 1 year warranty minimum, unless specified otherwise.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Model HBL1221 Series.
 - 2. Leviton 1221.
 - 3. Pass and Seymour PS20AC1.
 - 4. Substitutions: Refer to provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Description: NEMA WD 1, UL, DSCC, heavy-duty, AC only, general-use, grounding type, back and side wired, single pole, three-way and four-way as indicated, snap switch with hex-head equipment grounding screw. Switches shall have a steel, nickel plated bridge with integral ground, one piece rivetless copper alloy spring contact arm and terminal plate and large silver cadmium oxide contacts. All switches shall have quiet operating mechanisms without the use of mercury switches. All switches shall be approved by a third party agency, approved for the voltage and current indicated.
- C. Body and Handle: Gray plastic with toggle handle.
- D. Indicator Light: Neon lighted handle type switch; red color handle. Voltage per system rating.
- E. Locator Light: Neon lighted handle type switch; green color handle. Voltage per system rating.
- F. Ratings:
 - 1. Voltage: 120-277 volts AC.
 - 2. Current: 20 amperes.

2.2 WALL BOX LED DIMMERS

- A. Manufacturers:
 - 1. Lutron Nova T dimmer and switch.

2. Leviton.
3. Arrow Hart.
4. Substitutions: Refer to provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

- B. Description: Solid-state electronic (0-10V) dimmers; high end minimum of 92% of line voltage; provide voltage compensation to assure flicker free dimming through common voltage variations.
- C. Body and Handle: Gray plastic with preset slider.
- D. Voltage: 120/277 volts.
- E. Rating: Match load shown on drawings.

2.3 RECEPTACLES

- A. Manufacturers:
1. Hubbell Model HBL 5362.
 2. Leviton 5362.
 3. Pass and Seymour 5362A.
 4. Substitutions: Refer to provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Description: NEMA WD 1, UL, DSCC, heavy-duty, 20 ampere, 120 volt, general use, duplex, straight blade, grounding type receptacle arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall have a full wrap around brass bridge with integral ground and standup double wipe contacts. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct, green insulated conductor connection to the equipment grounding system.
- C. Device Face and Body: Gray nylon or reinforced thermoplastic.
- D. Configuration: NEMA WD 6, type as specified and indicated.
- E. Convenience Receptacle: Type 5-20R.

2.4 GROUND FAULT CIRCUIT INTERRUPTERS (GFI)

- A. Manufacturers:
1. Hubbell Model GFR8300.
 2. Leviton.
 3. Pass and Seymour.
 4. Substitutions: Refer to provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Description: NEMA WD 1, UL, DSCC, heavy-duty, 20 ampere, 120 volt, general use, duplex, straight blade, grounding type receptacle arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall have a full wrap around brass bridge with integral ground and standup double wipe contacts. The electronic component's circuit board shall be all glass with a conformal coating. Self grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct, green insulated conductor connection to the equipment grounding system.
- C. Device Face and Body: Gray nylon or reinforced thermoplastic.

- D. Configuration: NEMA WD 6, type as specified and indicated.
- E. Convenience Receptacle: Type 5-20R.

2.5 WALL PLATES

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Leviton.
 - 3. Pass and Seymour.
 - 4. Substitutions: Refer to provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Decorative Cover Plate: Single and combination, of types, sizes and with ganging and cutouts as indicated. Provide plates which mate and match with wiring devices to which attached. Material shall be smooth, 0.04" thick, type 302 Stainless Steel as manufactured by the device vendor.
- C. Weatherproof Cover Plate: Exterior mounted receptacles, and those noted to be weatherproof, shall be provided with weatherproof PVC transparent cover plates, standard size, and shall be single or ganged as indicated on the contract drawings. Weatherproof plates shall be "approved" third party listed as "raintight while in use".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure that outlet boxes are installed at proper height.
- B. Ensure that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation".
- B. Install devices vertically, plumb and level.
- C. Install switches with OFF position down.
- D. Install receptacles with grounding pole on top. Install horizontally oriented receptacles with the grounding pole on the left.
- E. Receptacles installed over counters, backsplashes, etc., shall be mounted horizontally.

- F. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- G. Do not share neutral conductor on load side of dimmers.
- H. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- I. Install decorative plates on switch, receptacle, and blank outlets in finished areas. Schedule installation of finish plates after the surface upon which they are installed has received final finish.
- J. Connect switches by wrapping conductor around screw terminal.
- K. Connect receptacles by utilizing back wiring provisions only. Do not use side wire terminals.
- L. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- M. Provide adhesive backed, laminated plastic receptacle device plate labels identifying the circuit feeding the device. Labels shall be label machine printed to indicate panel and circuit number and shall be Casio, Brother, T&B or approved equal. See Section 260553 for additional requirements

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 260534 to obtain mounting heights specified and indicated on drawings.
- B. All wiring devices shall be installed at heights as required by the ADA
- C. Install wall switch 48 inches above finished floor, measured to top of device plate.
- D. Install convenience receptacle 18 inches above finished floor, measured to bottom of device plate, unless noted otherwise on the Drawings.
- E. Install convenience receptacle horizontally 6 inches above backsplash of counter, unless noted otherwise on the Drawings.
- F. Install dimmer 48 inches above finished floor, measured to top of device of plate.
- G. Install telecommunications jack 18 inches above finished floor, measured to bottom of device plate, unless noted otherwise on the Drawings.
- H. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches above finished floor, unless noted otherwise on the Drawings.
- I. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 above finished floor, unless noted otherwise on the Drawings.

3.5 FIELD QUALITY CONTROL

- A. Quality Control. As required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Inspect each wiring device for defects.

- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify that each receptacle device is energized.
- E. Test each receptacle device for correct polarity and for ground continuity.
- F. Test each GFCI receptacle device for correct operation.

3.6 ADJUSTING

- A. Contract Closeout: Adjust installed work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

- A. Contract Closeout: Clean installed work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION 262726

SECTION 265100 - INTERIOR LUMINAIRES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior solid-state luminaires that use LED technology.
- B. Building mounted exterior luminaires.
- C. Luminaire accessories.

1.2 RELATED SECTIONS

- A. Section 260533 - Raceways and Boxes for Electrical Systems.
- B. Section 260519 - Building Wire and Cable.
- C. Section 260534 - Boxes.
- D. Section 260526 - Grounding and Bonding.
- E. Section 260553 - Electrical Identification.
- F. Section 262726 - Wiring Devices.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 SUBMITTALS FOR REVIEW

- A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.
- D. Submittal information will include IES and Photometric files with the fixture specifications. IES Photometric and LM79 data for the submitted LED fixtures, IES file must be from an NVLAP (National Voluntary Laboratory Accreditation Program) accredited laboratory. Submittal information will also include a

referenced location for a current installation of the proposed products where the operational performance of these proposed products can be observed and evaluated by the Owner. Provide photometric calculation for the following:

1. Typical office space.
2. Typical classroom space.
3. Each interior floor plan with emergency lighting fixtures only.
4. Exterior plan with emergency lighting fixtures only.

1.5 SUBMITTALS FOR INFORMATION

- A. Submittals: Submittals for information. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 SUBMITTALS FOR CLOSEOUT

- A. Contract Closeout: Submittals for project closeout. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Submit manufacturer's operation and maintenance instructions for each product.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Conform to requirements of NFPA 101.
- C. Lighting systems shall comply with the 2018 North Carolina State Energy Code and North Carolina Senate Bill 668.
- D. Products: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 EXTRA PRODUCTS

- A. Furnish one replacement LED lighting module for each type. Furnish one replacement LED lighting module for each 24 of each module type, but no less than one.
- B. Furnish one replacement LED driver type for each 24 of each type, but no less than one.
- C. Furnish one replacement exit lighting fixture for each 24 of each type, but no less than one.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Furnish Products as scheduled. Refer to relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections for substitutions and product options.
- B. All lighting fixtures shall be approved by third party testing agencies and NFPA and shall bear their label.
- C. All fixtures shall have a stock, or standard finish unless otherwise specified. Fixtures subject to corrosive or damp environments shall have corrosion resistant hardware and finishes.
- D. All fixtures shall be installed complete and operational.
- E. Lighting fixture types shall be furnished as required by the Lighting Fixture Schedule as indicated on the drawings. Catalog numbers are provided as a guide to the design and quality of fixture desired. Equivalent designs and equal quality fixtures of other manufacturers listed will be acceptable upon approval of the Architect/Engineer. The Contractor shall verify from the contract drawings the type ceilings or walls the fixture is to be used with and shall provide compatible mounting attachments and trim. Provide all accessories or additional materials required to maintain the ceiling fire rating as required by regulatory authorities.
- F. Interior Area LED Fixtures/Lamps:
 - 1. Kelvin temperature of in the range of 3500k to 4000k unless otherwise indicated in schedule.
 - 2. 75 plus lumens per watt minimum.
 - 3. CRI 85 or greater.
 - 4. 5-year warranty minimum with L70 of 50,000 hours or greater.
 - 5. Modular design for field replacement of parts.
 - 6. Series parallel matrix for prevention of LED string outages (not applicable to exit lights and recessed can fixtures).
 - 7. Tool less access to driver and LED modules.
 - 8. UL certified up to 90F degrees operating temperature.
- G. LED Drivers: Suitable for environment in which they are to be installed.
 - 1. Power Factor: 90 percent, minimum.
 - 2. Load regulation shall be +/-1% from no load to full load.
 - 3. Total Harmonic Distortion Rating: Less than 20 percent.
 - 4. Case temperature shall be rated for -40 deg C through +80 deg C and provided with thermal protection and self-limited short circuit and overload protection.
 - 5. Output shall be isolated.
 - 6. Driver Life Rating shall have less than 0.5% failure rate at the LED module's maximum L70 rated life.
 - 7. Driver manufacturer to be an industry leader, such as Advance or approved equal

2.2 LENSES

- A. Lenses shall be clear virgin acrylic material with uniform 3/16" square based female cone prisms aligned 45° to the length and width of the lens panel. Minimum prism depth shall be 0.080" with a nominal panel thickness of 0.156" and a minimum overall panel thickness of 0.150" to 0.160" inches.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- B. Lighting equipment shall be installed in a manner to be fully compliant with the seismic restraint requirements of the North Carolina State Building Code. Provide mounting devices and hardware, bracing, fittings, etc. as required for seismic restraint. See Specifications Section 260500 for additional requirements.
- C. Where a recessed fixture replaces a section or part of an acoustical ceiling tile, or a section or part of a suspended gypsum board ceiling, the fixture shall be supported at two (2) diagonal corners 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 or GWB ceiling system and shall be distinguished by color and tag. Attach one end of the wire to one corner of the fixture and the other end to the building's structural system. The lay-in or flange fixture shall then be screwed to the main runners of the lay-in ceiling track or GWB ceiling system 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. The Electrical Contractor shall be responsible for coordination work with the ceiling contractor; however, the ceiling contractor will provide framed openings for reception of lighting fixtures. All recessed fixtures shall be furnished with all necessary mounting accessories. Also, see the ASTM Section "E-580-02" items 3.3, 4.3, 5.5 & 5.6 and the NEC 300.11 & 410-36(B)
- D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- F. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts or screws.
- G. Install recessed luminaires to permit removal from below.
- H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings.
- J. Install accessories furnished with each luminaire.
- K. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 260534 using flexible conduit.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

3.2 FIELD QUALITY CONTROL

- A. Quality Assurance: Field inspection, testing and adjusting shall be as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

- A. Contract Closeout: Adjust installed work as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Aim and adjust luminaires as directed.

3.4 CLEANING

- A. Contract Closeout: Clean installed work as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS

- A. Contract Closeout: Demonstrate installed work as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Demonstrate luminaire operation for minimum of two hours.

3.6 PROTECTION OF FINISHED WORK

- A. Contract Closeout: Protect installed work as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Relamp luminaires that have failed lamps at Final Acceptance. Replace LED modules in which more than 5% of the LEDs have failed lamps at Final Acceptance of the Work.

END OF SECTION 265100

SECTION 270510 - TELECOMMUNICATIONS PATHWAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Equipment and terminal backboards.
- B. Premises wiring raceways and outlets.

1.2 RELATED SECTIONS

- A. Section 260533 - Conduit.
- B. Section 260534 - Boxes.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

- A. Individual and combination telecommunications/data outlets shall be installed where shown on the contract drawings. Raceways shall be installed as straight as possible and shall contain not more than the equivalent of three quarter bends.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Record actual locations and sizes of pathways and outlets.

1.6 QUALITY ASSURANCE

- A. Telephone Utility: Field verify.
- B. Perform Work in accordance with telephone utility's rules and regulations.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish Products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.
- C. Shall conform to UNCW Campus Telecommunications Department Guidelines.
- D. Shall conform to North Carolina STS-1000 Telecommunications Guidelines, which can be downloaded from the web site <http://www.its.state.nc.us/>

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS OUTLETS

- A. Outlets shall consist of standard, square cornered boxes 4-11/16" wide by 4-11/16" high by 2-1/8" deep, minimum, flush mounted at the height indicated on the contract drawings. Provide a single gang plaster ring for the square cornered boxes 4-11/16" wide by 4-11/16" high by 2-1/8" deep.

2.2 TELECOM WIRE AND CABLE

- A. All telephone, data and fiber cable shall be furnished and installed by the contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Support raceways and backboards under the provisions of Section 260529.
- B. Install termination backboards plumb, and attach securely to building wall at each corner.
- C. Install #14 gauge steel or approved, 200 lb. nylon cord pull wire in each empty conduit run. The maximum bends between pull points shall be 180 degrees.
- D. The maximum distance between pull boxes shall be 100 feet.

END OF SECTION 270510

SECTION 271500 - DATA AND VOICE COMMUNICATIONS CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes termination devices, and premises wiring for telephone and data communication circuits by certified manufacturers and contract installers with certification and testing of all equipment and cabling.
- B. The contractor shall obtain a copy of the Standards for Installation of Infrastructure/Network Communications at UNCW and this installation shall be in accordance with UNCW Standards and these specifications. If the contractor does not have a current copy of the UNCW standards, contact the engineer to have one emailed.

1.2 RELATED SECTIONS

- A. Division 9 - Painting
- B. Section 260000 - General Electrical
- C. Section 260533 - Conduit
- D. Section 260534 - Boxes
- E. Section 262726 - Wiring Devices
- F. Section 260553 - Electrical Identification

1.3 REFERENCES

- A. ANSI/TIA 568D.1 Commercial Building Telecommunication Cabling Standard.
- B. ANSI/TIA 569D 1.2 & 3 Commercial Building Standards for Telecommunications Pathways and Spaces.
- C. ANSI/TIA 606 Administration Standard for Commercial Telecommunication Infrastructure.
- D. ANSI/TIA 607 Telecommunications Grounding and Bonding for Customer Premises.
- E. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- F. NFPA 70 - National Electrical Code.
- G. UL® 969 - Standard for Marking and Labeling Systems.
- H. ISO/IEC 11801 - Information Technology, Generic cabling for customer premises.
- I. BISCI - Building Industries Consulting Services International.
- J. BISCI TDMM - Telecommunications Distribution Methods Manual.
- K. BISCI CO-OSP - Customer Outside Plant Design Manual
- L. STS-1000 Telecommunication Wiring Guidelines, latest edition.

- M. Standards for Installation of Infrastructure/Network Communications at UNCW

1.4 SYSTEM DESCRIPTION

- A. Provide, ready for operation, a complete and operational communication network infrastructure system that is a manufacturer certified 250 MHz, Cat 6 & 6A system.
- B. The system shall include, but not be limited to, cabling (copper and fiber optic), modules, faceplates, connectors, hardware, accessories, connections, and all other material, labor and operations required for a complete system in this building.
- C. Cabling shall be installed in raceways and/or on a cable support structure as shown on the Drawings. Raceways for cabling shall be installed in compliance with Section 260553. Cable support structure shall be as specified hereinafter.
- D. The horizontal wiring shall consist of the wiring from the telecommunication room(s) to the information services outlet. (The horizontal wiring includes the wiring termination components in the telecommunication room(s), the horizontal wiring itself, and the termination components at the outlet).
- E. Backbone cabling shall consist of fiber and copper cables to connect data and voice services as required and shown on the Drawings.
- F. Horizontal Wiring for Data and Telephone: Unless indicated otherwise on the Drawings, the normal connections requirements to a standard four position telecommunication outlet are two (2) data cables and two (2) voice cable to each outlet. The two data cables shall terminate at the telecommunications room rack designated for data on the manufacturers end-to-end termination Cat 6 hardware. The two voice cables shall terminate on the rack designated for voice terminations on the manufacturer's end-to-end termination Cat 6 hardware. Two data cables for WAP's shall terminate on the rack designated for voice terminations on the manufacturer's end-to-end termination Cat 6A hardware.
- G. The system shall be compliant with the Owner's long range strategic development plan to provide for current and future voice and data requirements by a planned end-to-end manufacturer's system, while recognizing the need for future bandwidth and fault tolerance. The proposed system shall utilize a network of fiber optic and unshielded twisted pair (UTP), riser, tie and station cables. Fiber cables shall terminate on Fiber Distribution Centers and/or modular patch panels as shown on the Drawings. Cables and terminations shall be identified at all locations and cables shall terminate in an alphanumeric sequence at all termination locations. The complete system shall be fully standards compliant. Copper and Fiber Optic drops shall be warranted to the link performance as defined by ANSI/TIA-568-D standards. All UTP end-to-end Channel Configurations as defined by ANSI/TIA 568D-1,2,3 shall be provided by a single manufacturer.

1.5 SUBMITTALS

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Submit catalog data for each termination device, cable, rack, etc.
- C. Test Reports: Indicate procedures and results for specified field testing and inspection.
- D. Reference paragraph 1.7 B below, submit copies of all BICSI RCDD certifications together with picture identification and itemized list of technicians and installers.

1.6 CLOSEOUT SUBMITTALS

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Project Record Documents: Record actual locations and sizes of pathways and outlets.
- C. Provide a certificate of completion of the installation with verifications that each copper cable pair has been tested to a minimum of 250 MHz.
- D. Provide a certificate of completion of the installation with verifications that each fiber optic cable has been tested to industry standards.
- E. Provide a Certified Installation Warranty Certificate.
- F. Provide Test results for each cable and outlet.
- G. Provide marked up Drawings showing additions, deletions, and modifications also identifying cable routings.
- H. Provide electronic copies of marked up final Drawings.
- I. Provide wall mounted copies of the final system Drawings in each telecommunications room.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in installing products specified in this section with minimum five years documented experience on projects utilizing infrastructure work similar to that required for this project, and with service facilities within 150 miles of project.
 - 1. The Installer shall be an experienced firm regularly engaged in the layout and the installation of cabling infrastructure systems. Documentation shall be provided to show that the Contractor has successfully completed projects of similar size and scope within the previous twelve months.
 - 2. The Installer shall be manufacturer certified and shall have a current valid certification card.
 - 3. The Telecommunication Project Manager shall:
 - a. be certified as BICSI RCDD
 - b. be experienced in this type of project and provide technical support.
 - c. attend monthly progress meetings and additional meetings as scheduled or required.
 - d. In addition to having the appropriate manufacturer certifications, the installing work force shall wear visible identification badges at the project site showing name, current photograph and company name.
- C. Testing Agency: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.
- D. The Manufacturer and Installation Contractor shall also note the requirements of Paragraph 2.1 below.

1.8 PRE-INSTALLATION MEETING

- A. Convene minimum one week prior to commencing Work of this section.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish Products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.
- C. Shall conform to UNCW Campus Telecommunications Department Guidelines.
- D. Shall conform to North Carolina STS-1000 Telecommunications Guidelines, which can be downloaded from the web site <http://www.its.state.nc.us/>

PART 2 - PRODUCTS

1.2 MANUFACTURERS

- A. All cabling, materials and components must be compatible with existing end to end solution.
- B. CommScope SYSTIMAX® Solutions GigaSPEED XL Category 6 Structured Cabling System and Corning Cable Systems LANScape solution
- C. CommScope SYSTIMAX® Solutions GigaSPEED X10D Category 6A Structured Cabling System with x91B reduced diameter cable and Corning Cable Systems LANScape solution (Access Solutions)
- D. CommScope SYSTIMAX Category 6 and Category 6A solutions require the contractor to be a current PartnerPRO network member; installers, supervisors, designers to have a current valid certification.

1.3 DATA OUTLET JACKS, PATCH PANELS AND PATCH CABLES

- A. Product Description: ANSI/TIA 568D Cat 6 compliant rack-mounted assembly or terminals and accessory patch cords.
- B. PATCH CORDS
 - 1. The provision of Patch cords shall be included in the project and provided by the voice/data contractor for the rack end and the work area outlet(s).
 - 2. Patch cords must be manufactured by the selected end-to-end system manufacturer and must be of correct grade to maintain the beyond Category 6 or beyond Category 6A channel rating.
 - 3. Installation of the patch cords will be by the contractor after review with Network communications.
 - 4. Patch cords for the work area outlet will be 50% 15 feet, 50% 20 feet. Unless otherwise designated by the Network communications department. The quantity for the Work area outlets will be for all Network communications data outlets throughout the facility.
 - 5. Patch cords for each data cable in the data rack(s) of all communications rooms. At the rack end, the patch cords will be 40% 2 feet, 40% 3 feet, and 20% 4 feet.
 - 6. Category 6A patch cords provided by contractor for each wireless access point. The length is a minimum of 5 feet and the quantity is for each wireless access point. The patch cord for the rack end will be included in the data cable quantity.
 - 7. Patch cords will be from one supplier and match the end-to-end solution installed for the project.
 - 8. Patch cords submittals are included for review and include lengths and quantities.
- C. Product Description: 8 pin modular jack (RJ45), Cat 6 compliant and conforming to ANSI/TIA 568 requirements for cable connectors for specific cable types. Wire per ANSI/TIA 568D pinout. Provide single gang plates with four (4) jack locations, configured for two (2) data and two (2) voice. Each faceplate shall have designated label strips for the top and bottom at each face plate.

- D. Jacks shall be as specified. All installers must be properly trained and certified by the manufacturer to install jacks according to manufacturer specifications.

Circuit	Jack	Color
Data	Cat 6	Yellow
Telephone/Voice	Cat 6	White
WAP	Cat 6A	Yellow

Outlet Faceplates shall match those specified in Section 262726 and shall provide for four jacks.

1.4 INTERIOR CABLES

- A. Network Data Cable shall be Cat 6 and WAP Data Cables shall be Cat 6A, installed to the strict ANSI/TIA 568D-1,2,3/569 BICSI and NEC guidelines for the installation of Cat 6 & Cat 6A cable, blue in color unless otherwise designated or required by environmental standards.
- B. Telecommunications Cable shall be Cat 6 with WHITE color jacket.
- C. Cat 6 & 6A UTP, 4 Pair (High Performance) cables shall extend between station location and terminal consisting of 4 pair, 100 ohm, 24 or 23 AWG solid conductors, and terminating on 8 pin modular jacks provided at each outlet. Cable jacket shall comply with NEC Article 800 for use as a plenum or non-plenum cable. The 4 pair UTP cable shall be UL® and cUL® Listed Type CMP (plenum) or CMR (non-plenum), as required. The high performance Cat 6 & 6A UTP cable shall be of the traditional round design with or without flute. The high performance Cat 6 & 6A cable shall be specified to 550 MHz and shall meet the guaranteed electrical performance and physical specifications as follows:

High Performance Category 6 cables Guaranteed electrical performance to 550 MHz:

Freq (MHz)	Attn DB/100m	Cat 6 Industry Standard (DB)	Required Cat 6 NEXT (DB)	Required Cat 6 Industry Standard (DB)	Required CAT 6 PS NEXT (DB)	Required CAT 6 Industry Standard (DB)	Required CAT 6 ELFEXT (DB)	Required CAT 6 Industry Standard (DB)	Required CAT 6 PS ELFEXT (DB)	Required CAT 6 Industry Standard (DB)	Required CAT 6 Return Loss	Required CAT 6 Industry Standard (DB)
0.772	1.6	≤ 1.8	76.0	≤ 76.0	74.0	≤ 74.0	70.0	≤ 70.0	67.0	≤ 67.0	‡	‡
1	1.8	≤ 2.0	74.3	≤ 74.3	72.3	≤ 72.3	67.8	≤ 67.8	64.8	≤ 64.8	20	20
4	3.6	≤ 3.8	65.3	≤ 65.3	63.3	≤ 63.3	55.7	≤ 55.7	52.7	≤ 52.7	23	23
8	5.1	≤ 5.4	60.8	≤ 60.8	58.8	≤ 58.8	49.7	≤ 49.7	46.7	≤ 46.7	24.5	24.5
10	5.8	≤ 6.0	59.3	≤ 59.3	57.3	≤ 57.3	47.8	≤ 47.8	44.8	≤ 44.8	25	25
16	7.3	≤ 7.6	56.3	≤ 56.3	54.3	≤ 54.3	43.7	≤ 43.7	40.7	≤ 40.7	25	25
20	8.2	≤ 8.5	54.8	≤ 54.8	52.8	≤ 52.8	41.7	≤ 41.7	38.7	≤ 38.7	25	25
25	9.2	≤ 9.6	53.3	≤ 53.3	51.3	≤ 51.3	39.8	≤ 39.8	36.8	≤ 36.8	24	24
31.25	10.4	≤ 10.7	51.9	≤ 51.9	49.9	≤ 49.9	37.9	≤ 37.9	34.9	≤ 34.9	24	24
62.5	15.0	≤ 15.5	47.4	≤ 47.4	45.4	≤ 45.4	31.8	≤ 31.8	28.8	≤ 28.8	22	22
100	19.3	≤ 19.9	44.3	≤ 44.3	42.3	≤ 42.3	27.8	≤ 27.8	24.8	≤ 24.8	20	20
200	28.3	≤ 29.2	39.8	≤ 39.8	37.8	≤ 37.8	21.7	≤ 21.7	18.7	≤ 18.7	18	18
250	32.1	≤ 33.0	38.3	≤ 38.3	36.3	≤ 36.3	19.8	≤ 19.8	16.8	≤ 16.8	17	17
300	35.6	‡	37.2	‡	35.2	‡	18.2	‡	15.2	‡	17	‡
350	38.9	‡	36.2	‡	34.2	‡	16.9	‡	13.9	‡	16	‡
400	42.0	‡	35.3	‡	33.3	‡	15.7	‡	12.7	‡	16	‡
450	45.0	‡	34.5	‡	32.5	‡	14.7	‡	11.7	‡	16	‡
500	47.9	‡	33.8	‡	31.8	‡	13.8	‡	10.8	‡	15	‡
550	50.6	‡	33.2	‡	31.2	‡	12.9	‡	9.9	‡	15	‡

‡ Not Specified

Testing is specified to 550 MHz. Cable manufacturer will have to provide the performance chart for their cable. Existing Systimax cable XL 7 series on campus meets the performance category listed.

1.5 CAMPUS FIBER-OPTIC DATA BACKBONE

A. Between Closets

1. Data cables shall be hybrid fiber-optic cable consisting of a minimum 6 or 12 strand single mode fiber (see telecommunications riser). Existing cables are siecor fiber-optic hybrid terminated on ST connectors mounted in Corning Cable Systems LANscape rack mounted hardware in the top position of the data rack.
2. All 6 and 12 strand fibers shall terminate in 12 port interconnect panels.

PART 3 - EXECUTION

1.6 INSTALLATION

- A. The project manager and crew shall be consistent through out the project. The project manager shall be present when any work is being performed. The project manager shall contact the Owner designated contact at the beginning and end of each day that work is to be performed.
- B. Cable shall be installed and terminated per manufacturer's specifications. The installer will observe the cabling practices described in ANSI/TIA 568-D. Standard industry practices guided by the ANSI/NECA/BICSI568-2001 BICSI TDM and BICSI installation manual shall be employed for cable installation, handling, grooming, etc. All cabling will be installed in a manner that will protect the cable from damage during installation, facilitate cable management and identification, and provide a neat and groomed appearance.
- C. Install wire and cable in accordance with ANSI/TIA 568D.1,2,3 and ANSI/TIA 569A.
- D. The maximum bends between pull points shall be 180 degrees.
- E. The maximum distance between pull boxes shall be 100 feet.
- F. If a continuous raceway system is not shown on the Drawings, all cabling not shown in raceway shall be supported with a cable support structure.
 1. Cabling shall be installed in straight paths and exit pathways at ninety-degree angles. Diagonal, beeline and or non-supported cabling are unacceptable. Cabling shall be routed as high as possible and above other building facilities in the path with the least obstructions in the ceiling space while maintaining the separation requirements of ANSI/TIA 568D1,2,3, ANSI/TIA 569A and NFPA 70 (NEC). There shall be a minimum distance of 3 inches between the cable and ceiling grid and cable pathways shall be clear of all possible EMF and RFI interference. Specifically cables shall be at least 2 feet away from all fluorescent lights and other potential EMF sources. Any violations of this shall be corrected at the contractor's expense. Cables shall not be run parallel with electrical conduits or strapped to them. The placing of cable ties shall not deform the cables.
 2. The cable support structure shall utilize Cat 6 approved cable supports and be sized to accommodate change. J hook type cable supports shall be securely fastened to the building structure and be spaced at a maximum distance of four (4) feet so that sag between supports does not exceed 12 inches. J hooks shall be sized as follows: two inch J hooks rated for 75 cables and shall be used to support cable paths of 50 or less cables, four inch J hooks rated for 150 cables and shall be used to support cable paths of 51 to 100 cables. All cable paths shall be sized with 20% spare capacity. All attachment hardware shall be approved for the type of installation and maximum load rating of the products to be installed.

- G. All penetrations through walls and floors shall be sleeved. All sleeves shall have permanently attached bushings. Sleeves shall be sized to accept 50% growth. All sleeves shall be fire-stopped using UL® approved methods and shall maintain assembly fire ratings. All sleeves between floors shall be supported with a conduit riser clamp installed per the manufacturer direction and shall be installed tight to the ceiling with enough sleeve to attach the bushing and rise up three inches above the floor on the opposite end.
- H. Existing sleeves and wall penetrations may be used provided no sleeve exceeds a 40 percent fill ratio. If using an existing sleeve, it shall have a permanently attached bushing, the contractor shall protect all existing cables and be responsible for any damage to existing cables. All existing sleeves and penetrations shall be firestopped and meet state and local codes at the completion of the installation.
- I. The horizontal cables shall be bundled in the ladder tray using Velcro cable ties. Plastic ty-wraps are not permitted. All cable shall be installed according to ANSI/TIA 568D-1, 2, 3 /569A standards.
- J. Cross-connect fields: 110 type IDC connecting clips shall be installed for every installed cable pair. Horizontal station cable shall have 12 inches spare cable at the station outlet and 10 feet of spare at each rack. Cat 5E power sum cables and fiber riser cable shall have 10 feet spare at each rack. Outside plant Cat 3 cables shall have 8 feet spare at each protector block. Cat 5E power sum cables from building protector blocks shall have 10 feet spare at protector blocks and voice racks. Fiber cables terminating into the building shall have a 20-foot service loop at the data rack. For inter-building cable ducts a slack loop of one full circle shall be arranged in each manhole
- K. All cable shall be installed in a complete, neat and orderly fashion. Install cable with sufficient bending radius as not to kink, shear or damage binders. Bend radius shall meet manufacturer's specifications for horizontal cable, fiber-optic cable, inter- and intra- building cable and copper inter- and intra- building cable. Cables shall be groomed, such that cables to be terminated on the left side of the patch panels are routed down the left side of the rack, and cables to be terminated on the right side of the patch panels are to be routed down the right side of the rack.
- L. Terminate all data and telephone cables at outlet devices. Terminate data cables on specified rack designated by the manufacturer's end-to-end solution equipment. Terminate telephone cables on specified rack using manufacturer's end-to-end solution for Cat 6.
- M. Rigid conduit or surface mounted raceway as indicated on the plans and specifications shall be used for all drops, flex hose shall not be used. If conditions DO NOT provide for conduit or surface mounted raceway to be used, the Contractor shall coordinate with NET-Com for permission to use alternate raceway.
- N. Install pullwire in each empty telephone or data conduit.
- O. Ground and bond pathways, cable shields, racks and equipment under the provisions of ANSI/TIA - 607 - Commercial Building Grounding/Bonding Requirements.
- P. Each end of all Cat 6 & 6A cable shall be labeled at approximately 3 to 6 inches from the Network Data/voice jack, CATV, and campus wide systems with a printed cable label. Labeling for the faceplate and block terminations shall be provided by the contractor with consultation from the Owner. All labeling shall comply with the ANSI/TIA-606A standard. The ER/TR labeling nomenclature shall match that of the station outlet (SO) identifier as listed below:
 - 1. Rack- mounted 110-block labeling: Each 110 block position (each 4-pair connector clip) shall be labeled as follows: Standard SO's/ wall phones outlets FVXX- where FVXX is the SO identifier where the Cat 6 cable on that connector clip terminates.
 - 2. Modular patch panel labeling: Each panel shall be labeled. Each modular jack panel position shall be labeled as XXX where XXX matches the SO identifier. The patch panel shall have a label placed on the upper left hand corner of the panel face identifying the panel.

- Q. All labels for the labeling shall be printed using a computer, printer or Brother P-Touch labeler with TZ tape or equivalent. Labels shall not be hand written. Labels shall be different colors as detailed for identification per the 606A standard. The contractor shall meet with the Owner and verify the numbering schemes and label coloring.
- R. The general numbering sequence shall conform to a sequential numbering pattern common to all floors of the facility. All cables shall be numbered sequentially from room to room as closely as possible. The final numbering scheme shall be agreed upon between the selected vendor and the building owner prior to the start of the physical installation.
- S. Station outlet labeling shall consist of two components: top faceplate label and a bottom faceplate label. The label shall have a five-character identifier with the format f-y-xxx. Where F= the floor number of the building, y is D for data or V for voice and xxx is an unique identifier between 0 and 999 for any station outlet on that floor served by the same ER/TR. Faceplate labels for wall phones shall consist of a 4 character identifier with the format f-v-xx. F= the floor number, V = is for voice, xx is a unique identifier between 0 and 99.
- T. ANSI/TIA 606 Administration standards for the Telecommunications Infrastructure of Commercial Buildings is incorporated by reference. Compliance shall be maintained. Each cable record shall indicate the cable type by manufacturer and manufacturer's designation and shall document every pair/conductor in the cable. The cable identifier shall be linked to all pathways in which it runs.
- U. Each piece of termination hardware such as a patch panel or wiring block shall have an unique named and label. Termination positions on cross-connect shall be identified by type (the pair /conductor terminated and a user code). For each element in the route, identification labels shall be completed and attached. Labels shall meet the requirements of UL969® Standard for Marking and Labeling Systems. A final report shall record system configuration, unique identifier, fiber labels, pathways and as-built details and as-built drawings. Loss Measurements and OTDR traces shall also be included with the records. Color coding to match UL606® requirements.

Cable numbering shall follow the example:

Example: CABLE D.5.2.013

D=DATA, V=VOICE

5=TELECOMMUNICATIONS ROOM NUMBER

2=FLOOR NUMBER

013=13TH CABLE TO BE INSTALLED

- V. All cables shall be installed according to ANSI/TIA 568D-1,2,3 /569A standards. Care shall be taken during the installation to prevent nicks, abrasions, burning and scuffing of the cable. Cables found to be damaged will be replaced at the contractor's expense regardless of whether the cable passes Cat 6 & 6A Level III testing standards.
- W. All WAPS locations shall be labeled utilizing above methods. All concealed locations shall have a green dot with label. Coordinate green dot and labeling with owner.

1.7 TESTING

A. Horizontal Cable Testing:

- 1. Each equipment telecommunications room patch cord, patch panel, horizontal cable, RJ 45 jack, station patch cord shall be tested end-to-end for compliance with Cat 6 & 6A level III parameters as stated in the ANSI/TIA 568 D1, 2, 3/ 569 standards. Only certified Cat 6 & 6A cable testing shall be used. The Test equipment used for horizontal Cat 6 & 6A cable tests shall be in compliance with the industry standard Cat 6 & 6A cable testers level III, and comply with ANSI/TIA test procedures. Each link shall be tested to ANSI/TIA 568-D.

2. Testing of all copper wiring shall be performed prior to system cutover. 100 percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. Voice and data horizontal wiring pairs shall be tested from the information outlet to the TR. Cat 5e cable runs shall be tested for conformance to the specifications of EIA/TIA 568D Annex D.
 3. Testing shall be accomplished using a ANSI/TIA TSB-67 UL® Certified Level II-E test set. Test shall include length, mutual capacitance, characteristic impedance, attenuation, and near-end and far-end cross talk and ELFEXT.
 4. The contractor, at no charge to the Owner, shall bring any pairs not meeting the requirements of the standard into compliance.
 5. Complete, end-to-end test results shall be submitted to the Owner. AMP testing shall follow the same procedure and use the Permanent link test to meet AMP requirements.
 6. All cable pairs must be tested for the following conditions in conjunction with or in addition to all ANSI/TIA 568D Cat 6 & 6A testing requirements: Polarity, Reversal of pairs, Wire transpositions, Continuity, Opens, Shorts.
- B. Fiber Optic Testing:
1. Each 62.5 OR 50/125-micron fiber shall be tested patch panel to patch panel at the 850 and 1300 nm wavelength in both directions using a light meter. Each single mode fiber shall be tested patch panel to patch panel at the 1310 and 1550 nm wavelength using a light meter. The maximum total attenuation for any single fiber between patch panels shall not exceed 3.0 dB.
 2. Power meter tests, for building risers, shall be accomplished for length, attenuation, and micro bends, and for each individual fiber. Test results shall be provided for each individual fiber and maintained for inclusion into the documentation package.
 3. Link attenuation does not include any active devices or passive devices other than cable connectors and splices.
 4. A final report shall be compiled that records system configuration, fiber labels, cable routes, and as-built details and as-built drawings.
- C. A Certified Cat 6 & 6A cable tester, Level III, shall perform the certification test on all Cat 6 & 6A cables and adhere to ANSI/TIA-568D.
- D. All test equipment shall be consistent throughout the installation. All test equipment shall be available for inspection by the Owner at any time. A valid and current calibration certificate traceable to the National Institute of Standards and Technology for any test equipment to be used shall be provided to the Owner.
- E. Provide electronic copies only of the computer generated reports of the test results.
- 1.8 FIELD QUALITY CONTROL
- A. Field inspection and testing shall be performed under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
 - B. Inspect, test and certify all cabling and equipment and terminations as specified and in accordance with ANSI/TIA 568 D.
- 1.9 MANUFACTURER WARRANTY
- A. Contractor shall provide a minimum Twenty Year cabling Extended Product Warranty and Application Assurance. The warranty shall support any performance claims the manufacturer makes over and above the Cat 6 & 6A standards stated herein.

- B. A Warranty Statement shall be provided by the Manufacturer stating the period of the Warranty for all the products specified for the project, the name and address of the authorized manufacturer's agent and also state who shall honor any and all Warranty claims.
- C. Extended Product Warranty shall cover product defects for all passive manufactured channel components. Passive components are defined as those exhibiting no gain or contributing no energy. As from the date of a Registration Certificate the Manufacturer shall Warrant:
 - 1. That the passive products that comprise the registered Channel solution shall be free from manufacturing defects in material or workmanship under normal and proper use;
 - 2. That all channel approved passive cabling products that comprise the registered Channel solution exceed the specification of ANSI/TIA 568-D and exceed ISO/IEC 11801 standards and shall be equal to or exceed the performance specifications of the associated Communication product data sheet in effect at the time the Registration Certificate is issued;
 - 3. That the installation shall meet the insertion and return loss, attenuation and near-end cross talk (NEXT) requirements of ANSI/TIA 568-D and the ISO/IEC 11801 standards for cabling links/channel configurations specified in these standards;
 - 4. That each channel is exclusively comprised of a single manufacturer's solution in accordance with application standards;
 - 5. This extended Product Warranty is applicable to the channel cabling solution products only on the original site of installation. Under the Extended Product Warranty, Manufacturer shall either repair or replace the defective product itself at Manufacturer's cost and, pay an Authorized Cable Installation Reseller for the cost of labor to repair or replace any such defective product on behalf of the Manufacturer; and
 - 6. Corning Cable Systems LANscape solutions "landscape extended warranty" a 25-year warranty on complete fiber optic cabling solutions. The telecom contractor shall be an authorized Corning Cabling Systems extended warranty (EWP) installer
- D. Application Assurance shall cover the failure of the channel structured cabling solution to operate the applications, which the Solution was designed to support, as well as additional application(s) defined below. Manufacturer shall warrant that the registered channel structured cabling solution shall be free from failures which prevent operation of the specific applications for which the original channel structured cabling solution was designed. The Application Assurance Program shall also cover the following additional applications:
 - 1. Those identified in the current (at the time of installation) channel structured cabling solution performance specifications; and
 - 2. In accordance with application standards specifications, any application introduced in the future by recognized standards or user forums that use ANSI/TIA 568-D or ISO/IEC 11801 components and link/channel specifications for cabling.
- E. Other Warranties
 - 1. Additional Warranty: The Contractor shall state any additional Contractor supplied warranty.
 - 2. Self-Install Warranty: The Cat 6 & 6A structured cabling manufacturers shall provide the Owner with a Self Install Warranty for all future moves, additions and changes to the end-to-end cabling solution provided for this project.

END OF SECTION 271500

SECTION 283111 - FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Initiating devices.
- B. Auxiliary devices.
- C. Signaling appliances.
- D. Fire alarm wire and cable.
- E. Protective devices.

This document substantially incorporates all of the relevant criteria contained in the "Fire Detection and Alarm Systems" (2020) as published by the North Carolina Department of Administration, State Construction Office.

1.2 RELATED SECTIONS

- A. Section 260533 - Conduit.
- B. Section 260519 - Building Wire and Cable.
- C. Section 260534 - Boxes.
- D. Section 260553 - Electrical Identification.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 72 - National Fire Alarm Code.
- C. NFPA 101 - Life Safety Code.
- D. North Carolina State Building Code.

1.4 SYSTEM DESCRIPTION

- A. This document provides for the relocating and reconnecting existing fire alarm devices to the existing fire alarm system to form a complete coordinated system ready for operation. It shall include, but not be limited to, all work required to relocate and reconnect devices. The fire alarm system shall comply with applicable provisions of the NC Building Code, NFPA 70 - National Electrical Code (NEC) and NFPA 72 -National Fire Alarm 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.

1.5 SUBMITTALS

- A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification.
- C. Product Data: Provide electrical characteristics and connection requirements, and 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.
- D. The fire alarm contractor shall submit complete Shop Drawings to the Architect/Engineer for review, prior to performing any work. They shall clearly demonstrate compliance with the Architect/Engineer's Drawings 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 shall be fully described.
- E. 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. Provide detailed battery and communications amplifier(s) capacity calculations.
- F. Architect/Engineer's approval (with or without comments) 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 Architect/Engineer gives written authorization.
- G. Installation Instructions: The contractor shall submit to the Architect/Engineer 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.
- H. Battery Calculations:
 - 1. Include a copy of system battery sizing calculations with the shop drawing submittal to the Architect/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 manufacturer's data sheet or NEC.
 - 2. Fire Alarm Vendor's calculations shall be submitted with the shop drawings, and prior to installation of equipment. In the submittal package identify Notification Appliance Circuits (NAC) current draws and voltage drops for each circuit. In no case shall the calculated voltage at any notification appliance fall below the minimum listed operating voltage for the devices used.
 - 3. The voltage drop at EOL shall 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 shall be no less than the minimum listed operating voltage for the alarm notification appliances used.
 - 4. All of these calculations shall be placed on a dedicated sheet of as-built drawings, for future reference by fire alarm service technicians. NAC voltage drop is to be verified during system tests.

- I. Maintenance Data: The contractor shall submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. This data, product data, and shop drawings shall be included in the maintenance manual.
- J. Certifications: 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. The installing contractor's technicians shall hold current (within previous 24 months) certifications issued by the manufacturer. These certifications shall be submitted to the Architect/Engineer prior to installation showing name, photo identification, date of training and date of certification.
- K. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and commissioning of products.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project. Products of firms that do not maintain factory authorized service organization and spare parts are not acceptable.
- B. Installer: Company specializing in installing the products specified in this section with minimum five years documented experience installing fire detection and alarm systems similar in size and scope of the project. The fire alarm contractor shall be authorized by his respective factory to ensure proper specification adherence, final connection, test, certification, warranty compliance, and service. Additionally, the fire alarm contractor shall submit a letter of authorization on official letterhead of the company product stating the company is an authorized distributor of that product. The company shall maintain a service organization with adequate spare parts inventory within 75 miles of the installation site.
- C. All connections to the FACP 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 model/series being installed. This training and certification shall have occurred within the most recent 24 months, except that a NICET Level III certification shall extend this to 36 months. Copies of the certifications shall be part of the Shop Drawing submittal to the Designers, prior to installation. The submittal cannot be approved without this information.

1.7 REGULATORY REQUIREMENTS

- A. Equipment and installation shall conform to requirements of NFPA 70, NFPA 72, NFPA 101, North Carolina State Building Code and shall be FM approved.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All equipment shall be compatible with existing system.

2.2 ALARM APPLIANCES

- A. 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: Shall meet minimum requirements of UL 1971. Provide strobe lights with minimum intensity Candela (Cd) rating of 15/75 Cd, or greater if such is indicated adjacent to the device symbol on the Drawings.
- B. Audible Devices:
1. Horns: Where provided, shall provide average ambient sound level of dBA as listed in the NEPA 72.
 2. Audible/Visual Combination Devices (Horn/Strobes and Programmable Electronic Sounders) shall comply with all applicable requirements for Horns, Programmable Electronic Sounders and Strobe Lights.
 3. 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.

2.3 INITIATING DEVICES

- A. Addressable Devices - General: All initiating devices shall be individually addressable, except aspirating type smoke detectors. 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 shall 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 two (2) wires.
 4. Operational Indications: Addressable initiation devices shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the device is operational and in regular communication with the control panel. Both LEDs shall be placed into steady illumination by the FACP to indicate that an alarm condition has been detected. The flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the device base to connect an external remote alarm LED.
 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 shall 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. Each detector or detector base shall incorporate an LED to indicate alarm.
 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 shall 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.
9. Device Identification: Detectors shall store an internal identifying type code that the control panel shall use to identify the type of device. Device identifications shall be ION or PHOTO, or THERMAL.
 10. 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.
 11. Ionization Smoke Detector: Ionization smoke detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.
 12. 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 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.
 13. Non-Rate of Rise Detectors: Provide thermal detectors with non-rate of rise thermal elements. Non-rate of rise detectors are indicated by NRR adjacent to the thermal detector symbol.
 14. 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.
 15. 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 sufficient smoke is sensed, an alarm signal shall be initiated at the FACP.
 16. 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 by the use of 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.
 17. Linear Beam Smoke Detectors: Shall be configured as an integral part of the Fire Alarm system and shall meet the following requirements:
 - a. Linear beam detectors shall have a minimum of three calibrated sensitivity settings capable of maintaining sensitivity between 1.0% and 2.0% per meter obscuration, at any operating distance between 10 and 60 meters.
 - b. The manufacturer of linear beam detector shall provide a calibration chart giving the Smoke Sensitivity versus Operating Distance for each sensitivity setting. This chart shall show the 3rd party listed sensitivity limits for the entire range of rated operating distances.
 - c. Linear beam detectors shall be rated for continuous operation up to 122°F (50°C) and a 95% relative humidity.
 - d. Compensating circuits shall be provided in the detector to maintain normal sensitivity as environment conditions change and as dust builds up on the lenses. When the limits of this compensation are reached, a "trouble" signal shall be initiated.
 - e. Horizontal and vertical adjustments shall be provided, on both the transmitter and the receiver, for alignment of the IR beam. They shall permit a minimum angular change of 7.5° from the center axis, in any direction.
 - f. The IR beam shall be modulated, to assure reliable operation in the presence of very high ambient light and/or background IR.
 - g. Abrupt, maintained blockage of the IR beam shall result in a "trouble" signal (not alarm), to be initiated within a time span of 10 seconds minimum to 60 seconds
 - h. The Beam Detector shall be composed of a transmitter device and a receiver device. A Beam Detector that utilizes a reflector is not allowed for this project.

2.4 AUXILIARY DEVICES

A. Addressable Dry Contact Monitor Module:

1. 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.
2. 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.
3. Supervision: Unless specifically noted otherwise on the drawings provide one monitor module for each sprinkler switch.
4. Two Wire Detector Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone, Class B (Style D or Style B operation) of non-addressable 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.
5. 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.

B. Addressable Control Module:

1. 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 using DIP switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. 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.
2. Configuration:
 - a. The control module NAC circuit may be wired for 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.
 - b. 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
 - c. Test Switch: A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.

C. Isolator Module:

1. 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. Modules shall be readily accessible (not above ceiling) and clearly labeled.
2. 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 shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
3. 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.
- D. Surge Protection: The following protection against voltage transients and surges shall 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-DN, or Di-Tech DTK-120SRD 20A, or equivalent UL 1449 - 2nd Edition Listed device.
 2. On DC Circuits Extending Outside Building: Adjacent to the FACP, and also near point of entry to outlying 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. Some acceptable models: Simplex 2081-9027, Simplex 2081-9028, Transtector TSP8601, Ditek DTK 2MHLP24B series, Citel America B280-24V, and Northern Technologies DLP-42. Submit data on others to the Architect/Engineer for approval. UL 497B listing is normally a prerequisite for their consideration. Devices using only MOV active elements are not acceptable.
- E. Wiring:
1. 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.
 2. 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.
 3. In underground conduit, Type TC or PLTC cable (PE insulated) shall be used to avoid problems from moisture.
- F. Terminal Cabinets: Terminal cabinets shall be sheet steel, hinged cover type not less than 10" x 16" x 10" deep. Cabinets shall conform to Specs Section 260534 and shall be labeled in accordance with Specs Section 260553.

PART 3 - EXECUTION

3.1 FIRE ALARM SYSTEM

- A. All equipment supplied shall 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.
- B. 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.
- C. 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 shall not be used with multi-sensor/multi-

criteria detectors under any circumstances, as inadequate system response may result. Most applications of analog addressable smoke detectors do not require alarm verification to reduce nuisance alarms, as they are better able to discriminate between fire and common non-fire ambient events. A short operational test with normal occupancy can determine if transient ambient events are a problem. Set spot-type smoke detector sensitivities to normal/medium, unless directed otherwise by the Architect/Engineer or Owner's rep. High sensitivity may be appropriate in relatively benign, clean environments such as art museums and libraries, to improve system response time without causing nuisance alarms.

- D. Print a complete System Status and Programming Report after the above steps have been done. This shall include the program settings for each alarm initiating device and the current sensitivity of each analog addressable smoke detector.

3.2 FIRE ALARM CONTROL EQUIPMENT INSTALLATION

- A. The technician who makes final connections and programs the FACP is the "installer".
- B. Notification Appliance Circuit booster power supplies shall 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 shall also be monitored for integrity.
- C. Alarm notification appliances (audible and visible) shall comply with NFPA 72, the North Carolina Building Code, and ANSI 117 criteria for intensity and placement. The audible evacuation signal shall be the ANSI S3.41 three-pulse temporal pattern. All strobe lights installed in a single space shall be synchronized.

3.3 ADDRESSABLE INTERFACE MODULES (Control and Monitor Modules)

- A. Addressable interface modules (used to monitor all contact type initiating devices) shall be located in conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location.
- B. One module may serve as many as 3 sprinkler system valve supervisory switches in a single space; otherwise provide one module per switch.
- C. One module may serve as many as 6 heat detectors in a single space
- D. Sprinkler system supervisory circuits for monitoring valve position, air pressure, water temperature, pump status, etc., shall cause distinct audible and visible indications at the FACP. The audible supervisory signal shall either be a 4" diameter bell or a pulsing piezo-electric alarm. Provide the following engraved label adjacent to the bell/alarm: "SPRINKLER STATUS ABNORMAL". If only valve position is supervised, provide an engraved label reading: "SPRINKLER VALVE CLOSED"

3.4 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 shall 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.

3.5 AC POWER

- A. Switching to emergency power during alarm shall not cause signal drop-out. Batteries shall 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 shall be physically protected by panelboard lock or handle lock and each shall 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.
- D. The fire alarm system shall monitor 120vac 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 is activated, or primary elevator power shut-down upon sprinkler flow in any elevator equipment space or shaft. Use an addressable monitor module to accomplish this supervisory function.

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 shall meet the performance and installation requirements of Section 260533 "Raceways and Boxes for Electrical Systems".
- D. If cable size and the requirement to maintain a Class "A" loop on all Signaling Line Circuits cause conduit fill to exceed specified maximums for the 1/2" size; 3/4" raceway shall be used.
- E. All conduits that penetrate outside walls from air conditioned space shall have internal sealing (duct-seal), to prevent condensation from infiltrating humid air.
- F. 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
- G. To minimize wiring fault impact, isolation modules shall be provided in all of the locations listed below. If ceiling height ≤ 10 feet, isolator base type initiating devices are permitted to be used to satisfy any or all of the following:

1. In or immediately adjacent to the FACP, at each end of the addressable loop. These two isolators shall 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 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 shall be clearly labeled, readily accessible for convenient inspection (not above a lay-in ceiling), and shown on as-built drawings.
- H. Detection or alarm circuits shall 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 shall be properly separated from other circuits and the enclosure shall have an appropriate warning label to alert service personnel to the potential hazard.
- I. Style 6 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 Style 6 circuits.
- J. 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 shall 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.
- 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 a megger. Provide advance notice to the Architect/Engineer 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 NOTIFICATION DEVICES
- A. Both audible and visible alarm signals shall be provided. Visible signals shall 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 B. The load connected to each circuit shall not exceed 80% of rated module output and the coverage of each circuit shall not exceed 3 floors (to limit the effect of faults, and to facilitate trouble-shooting). The NAC voltage drop during alarm shall not exceed 14% of the voltage measured across the batteries at that time. To achieve this, the design shall consider wire size, length of circuit, device load, inherent voltage loss within the FACP's power supply, etc. The contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly.
- C. End of Line (EOL) Device: The end of line device shall be installed in accessible terminal cabinets or dedicated accessible boxes, to facilitate testing and maintenance.

3.8 DETECTORS

- A. Detectors used for elevator: Primary, alternate recall points and the machine room & the shaft shall be indicated on the control Matrix. Elevator capture or control signals shall come from the FACP as relayed by control modules.
- 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 shall 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 shall 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 also 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 shall be printed labels with black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.

3.9 ALARM VERIFICATION FOR SMOKE DETECTORS

- A. The fire alarm system shall be equipped with Alarm Verification.
- B. System shall provide as a feature an alternate signal processing algorithm to verify the presence of smoke. The algorithm shall be selectable during system programming. The total effective delay created by the verification algorithm shall not exceed 60 seconds.

3.10 FIRE ALARM SYSTEM INSTALLATION AND CONFIGURATION

- A. Floor Plans with Device Numbers: A copy of the floor plans shall be provided in 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. Plans shall be bound in book form. Sheets shall be laminated. Provide legend for symbols. Provide holder for plan book in panel or in a locked box adjacent to panel keyed to match panel. Provide label for box and book.
- B. Loop 1 shall be assigned to the first floor 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.

3.11 SYSTEM DOCUMENTATION, TRAINING AND MAINTENANCE

- A. Maintenance: The manufacturer, or authorized distributor, shall maintain software version 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 Architect/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's 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 shall be stored on electronic media and archived by the fire alarm system manufacturer or authorized distributor. A diskette or CD copy of this data shall be submitted to the Architect/Engineer for transmission to the owner on the day the system is commissioned. The contractor shall provide the owner with one copy of the following:
 - 1. All software required, both for the installed fire alarm system and personal computer (PC) necessary to access the fire alarm system for trouble shooting, programming, modifications, monitoring, debugging, or similar functions, (if Owner does not have the needed PC to check the 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.
 - 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).

3.12 SYSTEM TESTING AND CERTIFICATION

- A. Upon completion of the installation the Contractor and the Manufacturer's authorized installer together shall conduct a test of each and every alarm initiating device relocated or added during this project during this project including sprinkler heat trace monitor module plus 10% of existing devices for proper response. The system shall operate for 48 hours prior to start of test. The Contractor shall be present for the test.
- B. A NFPA reacceptance test must be performed per NFPA 14.4.2.
- C. The A/E and owner shall be given 7 days advance notice of the tests. All Audio Visual Device Testing shall be scheduled with the owner.

3.13 PRE-FINAL AND FINAL INSPECTION

- A. Pre-Final Inspection: At the Owner's request and after passing the Designer's pre-final inspection, the Contractor and Manufacturer's authorized installer shall conduct system test in the presence of the Owner and the Designer.
- B. Final Inspection: The fire alarm system shall be inspected, with portions of it functionally tested. This shall 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 shall 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 functional operational test as required by NFPA 72. The electrical contractor shall provide two-way radios, ladders, and any other materials needed for testing the system, including a suitable smoke source.
- C. The test shall be conducted entirely by the Contractor. A copy of the final database software shall 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 shall 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 shall 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 efficiencies, the manufacturer's authorized representative shall issue a test report to the Architect/Engineer and Owner, detailing and certifying the test.
 - 3. System Acceptance: After successful completion of the Final Inspection and recommendation of the Architect/Engineer, the system shall be accepted by the Owner. At this time the warranty period begins.

END OF SECTION 283111

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 Specification Sections, apply to this Section.
- B. North Carolina Department of Transportation and City of Wilmington Standard Specifications and Details where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
 - 2. Excavating and backfilling for structures.
 - 3. Subbase course for concrete walks and pavements.
 - 4. Subbase course and base course for asphalt paving.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Sections:
 - 1. Section 013200 "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
 - 3. 334100 "Storm Utility Drainage Piping".

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices and quantity allowances for earth moving specified in Division 01 Section "Unit Prices and Allowances."

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer or Owner's Testing Agency. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer or Owner's Testing Agency. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Reinforced Soil Fill: Soil materials specifically designed and compacted for use with Segmental Retaining walls designed by others.
- J. Structural Fill: Soil free of trash, refuse, frozen material, or other deleterious materials, and contains less than 3% organics. Shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geosynthetics.
 - 2. Lime and/or cement utilized for soil/base modification.
 - 3. ABC stone
 - 4. Detector warning tapes.
- B. Material Test Reports: For each off-site soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 698.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
- B. Pre-excavation Conference: Conduct conference at the Project Site prior to commencement of site grading.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, parking lots, access drives, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Obtain a Dig Permit from UNCW and notify "North Carolina OneCall (811)" for area where Project is located before beginning earth moving operations.
- C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place.
- D. Do not commence earth moving operations until a NCDEQ Erosion Control Plan Letter of Approval are obtained and posted at the project site.
- E. Do not commence earth moving operations until plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Unified Soil Classification System (USCS) Groups SM, SC, SW, and SP according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, greater than 3% organic material, and other deleterious matter.
 - 1. Compacted to not less than 95% of the Standard Proctor maximum below 12" and not less than 98% of the standard Proctor maximum for the last 12".
 - 2. Fill soils should possess a standard Proctor maximum dry density of at least 100 pounds per cubic foot (pcf) for the structural fill and at least 90 pounds per cubic foot (pcf) for the low permeability fill.
- C. Unsatisfactory (or Unsuitable) Soils: Soil Classification Groups OL and OH according to ASTM D 2487, or a combination of these groups.

1. Fill materials shall not be classified as unsatisfactory if the fill materials' natural moistures are outside the required moisture range and otherwise meet the material requirements for satisfactory materials. The contractor shall dry these materials to the acceptable moisture range.
- D. Base Course: Aggregate meeting the ABC stone requirements specified in section 1005-3 and 1005-4 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures, January 2012.
- E. Structural Fill: Same as Satisfactory Soils.
- F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- H. Sand: ASTM C 33; fine aggregate.
- I. Low Permeability Fill: ASTM D 2487; CL, CH, and MH soil classification groups or a combination of these groups; free of debris, waste, frozen materials, vegetation, and other deleterious matter. Shall have a maximum dimension of 3 inches. Shall have a permeability of equal to or less than that value indicated on the design drawings when compacted to the degree indicated on the design drawings.
- J. Dam Embankment/Key Trench: Unified Soil Classification System (USCS) Groups ML and CL according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 6 inches in any dimension, roots, stumps, wood, debris, waste, frozen materials, and other deleterious matter.
 1. All fill soils used in the Dam Embankment/Key Trench construction shall be compacted to at least 95% of the standard proctor maximum dry density (ASTM-698).
 2. Fill Soils shall be compacted at a moisture content within -1 to +3 percent of its optimum moisture content.

2.2 GEOTEXTILES

- A. Subsurface Drainage / Separation Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; complying with AASHTO M 288 and the following, measured per test methods referenced:
 1. Grab Tensile Strength: 205 lb; ASTM D 4632.
 2. Grab Tensile Elongation: 50%; ASTM D 4632.
 3. Trapezoidal Tear Strength: 80 lb; ASTM D 4533.
 4. CBR Puncture Strength: 500 lb; ASTM D 6241.
 5. Apparent Opening Size: No. 80 sieve, maximum; ASTM D 4751.
 6. Permittivity: 1.1 per second, minimum; ASTM D 4491.
 7. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.
- B. Stabilization Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 1. Grab Tensile Strength: 247 lbf; ASTM D 4632.
 2. Sewn Seam Strength: 222 lbf; ASTM D 4632.
 3. Tear Strength: 90 lbf; ASTM D 4533.
 4. Puncture Strength: 90 lbf; ASTM D 4833.
 5. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.

6. Permittivity: 0.02 per second, minimum; ASTM D 4491.
7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- C. Detectable Tracer Wire: In accordance with NC General Statute 87-121 (g), the University requires a #12 solid bare copper wire is to be installed with gravity sewer mains and services, storm drainage systems, reuse mains and services, and any nonmetallic water service tubing. It is not required for DIP water mains or copper water services.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Follow Construction Sequence provided on Drawings.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- C. Protect and maintain erosion and sedimentation controls during earth moving operations.
- D. Remove from site, material encountered in grading operations that is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.
- E. Remove from site, material encountered in grading operations that is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.
- F. Prior to placing fill in low areas, such as previously existing creeks, or ponds, perform following procedures:
 1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.

2. After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.
 3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not within 5'-0" of perimeter of paving or retaining wall subgrade. If, after observation, material is found to be unsatisfactory, it shall be removed from site.
- G. After topsoil stripping, notify Owner's Testing Agency. Proof-roll exposed subgrades to identify soft pockets and areas of excess yielding. Do not proof-roll wet or frozen subgrades.
1. Completely proof-roll subgrade in one direction with a heavy vibratory smooth drum roller, having a weight of at least 10 tons, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer or Owner's Testing Agency, and replace with compacted backfill or fill as directed.
- H. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXPLOSIVES

- A. Explosives and/or blasting are expressly prohibited.

3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include pavements, underground structures, utilities, obstructions, and other items indicated to be removed; together with soil, boulders, and rock. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation, removal of obstructions, or unsuitable soils to subgrade elevation.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials, replace with satisfactory materials.
- B. Unsatisfactory Soils: Volume of unsatisfactory soils and/or unsuitable debris actually removed below the subgrade/bearing elevation, measured in original position, and replaced with satisfactory subgrade/foundation material that meets the allowable design bearing pressure, compaction requirements, and construction documents for the site and structure. Unsatisfactory soils shall not be removed until approved and the volume is determined by measuring the excavation by the Owner's Testing Agency. Truck counts will not be accepted as a method to determine unsatisfactory soils removed. Changes in the Contract Sum or the Contract Time will be in accordance with Allowances and Unit Prices provisions for removal and replacement of unsuitable soils.

3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 SUBGRADE EVALUATION

- A. Notify Owner's Testing Agency when excavations have reached required subgrade.
- B. If Owner's Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below pavements in to identify soft pockets and areas of excess yielding. Do not proofroll wet or frozen subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer or Owner's Testing Agency, and replace with compacted backfill or fill as directed.
- D. No changes in the Contract Sum or the Contract Time will be authorized for removal of obstructions, or unsuitable soils to subgrade elevation.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations as directed by Engineer.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations.
 2. Place silt fence approximately 3-ft from edge of stockpile.
 3. Do not store within drip line of remaining trees.

3.9 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil.
- D. Trenches under Roadways: After installing and testing piping or conduit less than 30 inches below surface of roadways, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil compacted in accordance with specifications provided herein while removing shoring and bracing.
- F. Place and compact initial backfill of subbase material and satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. All underground piping and utilities (both metallic and non-metallic), except lawn irrigation lines, shall have two stages of identification and/or warning by a combination of non-detectable and detectable warning tapes.
- I. Install warning tape (detectable warning tape) directly on top of the pipeline and permanently secured to the pipeline at 10' intervals.
- J. Install identification tape (non-detectable warning tape) approximately 18" to 30" above the service pipe, but a minimum of 10" and a maximum of 24" below finished grade.
- K. Install tracer wire to bottom of pipe taped at a maximum of 10' intervals. An insulated copper tracer wire or other approved conductor shall be installed along the length of the pipe to all nonmetallic piping, including irrigation lines, and metallic pipe with compression gasket fittings installed underground. Access shall be provided to the tracer wire or the tracer wire shall terminate aboveground at the end of the nonmetallic piping. The tracer wire size shall be copper single-conductor 10AWG minimum and the insulation type suitable for direct burial with type "UF" (Underground Feeder) insulation and shall be continuous along the pipeline passing through the inside of each valve box or manhole.

3.11 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers using satisfactory fill (or structural fill) to required elevations.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Fill materials shall not be classified as unsatisfactory if the fill materials' natural moistures are outside the required moisture range and otherwise meet the material requirements for satisfactory materials. The contractor shall dry these materials to the acceptable moisture range.
 - 3. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact as follows:

Location	Percent of Maximum Laboratory Density ASTM D698
Subgrade and Fill below Structures and Pavement (top 12 inches)	98
Subgrade and Fill below Structures and Pavement (below top 12 inches)	95
Subgrade & Fill in All other Areas	90

3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.

3.15 BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades approved by the Owner's Testing Agency free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 - 1. Place base course material over subgrade under hot-mix asphalt pavement.
 - 2. Shape base course to required crown elevations and cross-slope grades.
 - 3. Place base course 10 inches or less in compacted thickness in a single layer.
 - 4. Place base course that exceeds 10 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 4 inches thick.
 - 5. Compact base course at moisture content within +/- 2% of optimum moisture to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to AASHTO T-180 as modified by NCDOT.
- C. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each base layer to not less than 98 percent of maximum dry unit weight according to AASHTO T-180 as modified by NCDOT.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material and maximum lift thickness comply with requirements.
 - 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
 - 4. Full-time observation and testing for retaining walls.
- B. Owner's Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to evaluate and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved: At subgrade and at each compacted fill and backfill layer, at least one test for every 2500 sq. ft. or less of paved area, but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- D. Maintain subgrades to receive base course stone within compaction and moisture requirements continuously until stone is placed.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Transport surplus satisfactory soil and topsoil to designated storage areas on Owner's property or remove from site and legally dispose as directed by Engineer. Stockpile or spread soil as directed by Engineer.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

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 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Curbs and gutters.
 - 2. Walks.
- B. Related Sections:
 - 1. Section 033000 "Cast-in-Place Concrete"
 - 2. Section 312000 "Earth Moving"

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product info: Data, Test Reports, and Material Certifications for each type of product indicated as required in Section 033000.
- B. Furnish drawings indicating jointing pattern proposed for all areas of concrete pavement for approval by the Engineer. Only information completely checked by the manufacturer and the General Contractor will be considered by the Engineer.

1.5 QUALITY ASSURANCE

- A. Products and methods of execution are specified by reference to North Carolina State Department of Transportation and Highway Safety's "Standard Specifications for Roads and Structure" (latest edition). The abbreviation NCDOT is used to designate this publication. Equivalent alternate products and methods of execution as defined by the specifications. All methods and substitutions must be approved by the Engineer.
- B. Testing: The Owner's Testing Agency will evaluate concrete delivered to and placed at the site in accordance with requirements of Section 033000.
- C. Pre-installation Conference: Conduct conference at the Project Site.
 - 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete paving subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces. Forms shall remain in place for a minimum of 24 hours after concrete placement or until concrete is secure. Use straight forms, free of distortion and defects, extending the full depth of concrete. All forms shall receive a form coating the full depth of concrete per Section 033000 of these specifications prior to placing concrete.
 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
- C. Automatic Machine Curb and Gutter:
 1. Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, Contractor shall submit revised mix design and laboratory test results which meet or exceed minimums specified.
 2. Machine placement must produce curb and gutters to required cross-section, line grades, finish, and jointing as specified for formed concrete. If results are not acceptable, Contractor shall remove and replace with formed concrete as specified.

2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A-185, fabricated from steel wire into flat sheets.
- C. Tie Bars: ASTM A 615, Grade 60, deformed.
- D. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to

CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

- F. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

- A. Concrete: Concrete and equipment, workmanship and materials for forming shall conform to applicable requirements of Section 033000, unless otherwise specified. Concrete shall be standard weight with minimum compressive strength as specified on the construction drawings for the various applications.

2.4 CURING MATERIALS

- A. Curing Compound shall be one of the following:
1. Guardian Chemical Company; Clear Bond
 2. Toch Brothers, Inc.; Sealkure
 3. Penn-Dixie; Klearseal
 4. Engineer's approved equivalent

2.5 RELATED MATERIALS

- A. Expansion Joint Fillers: Expansion joint fillers shall be 1/2-inch thick unless otherwise shown on Drawings, equivalent to and shall conform to NCDOT Section 1028:
1. W.R. Meadows; Celotex Flexcell, Fibre
 2. K & P Petroleum Products; Tex-Lite
 3. Sonneborn; Sonolastic Sealant
- B. Joint Sealer: Silicone sealant as manufactured by Surebond Inc., WR Meadows, Dow Corning, Silka Corporation or equivalent.

2.6 DETECTABLE WARNING MATERIALS

- A. In accordance with City of Wilmington standards and details.

2.7 CONCRETE MIXTURES

- A. Concrete mixture shall conform to applicable requirements of Section 033000.
- B. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with Owner requirements.

2.8 CONCRETE MIXING

- A. Concrete mixing shall conform to applicable requirements of Section 033000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Engineer or Owner's Testing Agency.

3.2 PREPARATION

- A. Remove loose material from compacted base or subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963.

- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Butt Joints: Use a bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 2 inches into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
 - 1. Locate 1/2-inch expansion joints at intervals of 30 feet unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2-inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. For concrete walks provide contraction joints at 5'-0" (max) o.c., unless otherwise shown on Drawings. For curb and gutter, joints shall be in accordance with the Drawing detail. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 - 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing. Curbs shall be true, straight, and of uniform level and slope. All construction shall conform to NCDOT Section 846 and applicable requirements therein. The concrete shall be given a light broom finish with brush marks parallel to the curb line or gutter line.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
- L. Cold-Weather Placement: Refer to Section 033000 "Cast in Place Concrete"
- M. Hot-Weather Placement: Refer to Section 033000 "Cast in Place Concrete"
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided

water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations. Finishing operations shall conform to the requirement of NCDOT Section 710.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Immediately after finishing operations, cure exposed concrete surfaces in accordance with NCDOT Section 700.
- F. After curing, remove debris and backfill area adjoining sidewalk and paving. Grade and compact to conform to surrounding area in accordance with lines and grades indicated on Drawings. Remove damaged concrete that does not drain properly and reconstruct at no additional cost to Owner.

3.9 FIELD QUALITY CONTROL

- A. Sampling: See Section 033000 "Cast-in-Place Concrete" for testing requirements.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer.
- B. Drill test cores where directed by Engineer or Owner's Testing Agency, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive. See Section 033000 "Cast-In-Place Concrete" for testing requirements.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Final Acceptance inspections.

END OF SECTION 321313

SECTION 329115 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes planting soils specified according to performance requirements of the mixes.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.

1.2 DEFINITIONS

- A. CEC: Cation exchange capacity.
- B. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- C. Imported Soil: Soil that is transported to Project site for use.
- D. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- E. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- F. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- H. SSSA: Soil Science Society of America.
- I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- J. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- K. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- L. USCC: U.S. Composting Council.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each bulk-supplied material in sealed containers labeled with content, source, and date obtained; providing an accurate representation of composition, color, and texture.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS

- A. Planting-Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained modified to produce viable planting soil. Using preconstruction soil analyses and materials specified in other articles of this Section, amend existing, on-site surface soil to become planting soil complying with the following requirements:
 - 1. ASTM D 5862
 - 2. Percentage of Organic Matter: Minimum 6 percent by volume.
 - 3. Soil Reaction: pH of 5.5 to 7.
- B. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam according to USDA textures; and modified to produce viable planting soil. Amend imported soil with materials specified in other articles of this Section to become planting soil complying with the following requirements:
 - 1. ASTM D 5862
 - 2. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
 - 3. Additional Properties of Imported Soil before Amending: Minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration. Clean soil to be of the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
 - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1 inch in any dimension.

- C. Planting-Soil Type: Manufactured soil consisting of manufacturer's basic topsoil, blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials as specified in other articles of this Section to produce viable planting soil.
 - 1. Basic Properties: Manufactured soil shall not contain the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
 - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1 inch in any dimension.
 - 2. Percentage of Organic Matter: Minimum 6 percent by volume.
 - 3. Soil Reaction: pH of 5.5 to 7.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- E. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
 - 1. Feedstock: Limited to leaves.
 - 2. Reaction: pH of 5.5 to 8.
 - 3. Soluble-Salt Concentration: Less than 4 dS/m.
 - 4. Moisture Content: 35 to 55 percent by weight.
 - 5. Organic-Matter Content: 50 to 60 percent of dry weight.
 - 6. Particle Size: Minimum of 98 percent passing through a 3/4-inch sieve.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
- D. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

- E. 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, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble.
- B. 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.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth of 8 inches and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a combined maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- D. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread unamended soil to total depth of 3 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
 - a. Mix lime and sulfur with dry soil before mixing fertilizer.
 - b. Mix fertilizer with planting soil no more than seven days before planting.
 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- 3.4 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE
- A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Application: Spread planting soil to total depth of 3 inches, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
1. Lifts: Apply planting soil in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- 3.5 BLENDING PLANTING SOIL IN PLACE
- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 8 inches. Remove stones larger than 1-inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
1. Mix lime and sulfur with dry soil before mixing fertilizer.
 2. Mix fertilizer with planting soil no more than seven days before planting.
- D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 except where a different compaction value is indicated on Drawings.

- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D698. Space tests at no less than one for each 2000 sq. ft. of in-place soil or part thereof.
 - 2. Performance Testing: For each amended planting-soil type, demonstrating compliance with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
- C. Soil will be considered defective if it does not pass tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.8 PROTECTION AND CLEANING

- A. Protection Zone: Identify protection zones.
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329115

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding.

1.2 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. NCDOT: North Carolina Department of Transportation
- E. NCDEQ - DEMLR: North Carolina Department of Environmental Quality - Division of Energy, Mineral, and Land Resources.
- F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- G. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- H. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- J. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- K. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of grass seed.

1. Certification of each seed mixture.

C. Product certificates of conformance

1. Seed
2. Sod
3. Fertilizer
4. Soil Amendments
5. Soil
6. Mulch
7. Erosion Control Materials
8. Pesticides
9. Herbicide

1.4 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1. Pesticide Applicator: State licensed, commercial.

- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.

1. The soil-testing laboratory shall oversee soil sampling.
2. Recommended Soil Testing Laboratory: NC Department of Agriculture
3. Report suitability of tested soil for turf growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable. Label in conformance with the USDA Federal Seed Act, any other statutes, rules and regulations and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Fertilizer and Lime: Deliver materials to the site in the original, unopened containers bearing the manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. In lieu of containers, furnish fertilizer and lime in bulk with a certificate indicating the information described above with each delivery

1.6 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 30 days from date of planting completion
2. Sodded Turf: 30 days from date of planting completion
3. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Permanent Grass Seed Species: State-certified seed of grass species of the latest season's crop as follows:
 1. Certified Princess 77 Bermudagrass or other as approved by owner.
- C. Temporary Grass Seed Mix: Proprietary seed mix as follows:
 1. Products: Subject to compliance with NCDEQ and NCDOT erosion control requirements, provide the following according to season of planting.
 - a. Late Winter – Early Spring (Feb 1 – May 1): Annual Ryegrass
 - b. Summer (Apr 15-Aug 15): German Millet
 - c. Fall (Aug 15 – Dec 30): Annual Ryegrass

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Certified and complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows:
 1. Bermuda Type 419 "Tifway" or other as approved by owner.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
 2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 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: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 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.

2.4 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 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, 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 and free of chips, stones, sticks, soil, or toxic materials.
- E. 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.

2.5 FERTILIZERS

- A. Fertilizer shall be delivered in unopened, original containers each bearing the manufacturer's guaranteed analysis. Fertilizer shall be commercial grade, free flowing, and uniform in composition. Any fertilizer which becomes caked or otherwise damaged shall not be accepted.
- B. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- C. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- D. 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: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- E. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.6 PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil with pH range of 5.5 to 7 and a minimum of 2 percent organic material content, or existing native surface topsoil formed under natural conditions with the duff layer retained during excavation process, or existing in-place surface soil, or imported topsoil or manufactured topsoil from off-site sources. Do not obtain from agricultural land, bogs or marshes. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix soil with the following soil amendments and fertilizers according to soil analysis results and recommendations to produce planting soil.

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 at 4,000lb/ac.
- B. 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 sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

2.8 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.9 HERBICIDES

- A. Non-selective 41% Glyphosate product.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - 3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.

2. Loosen surface soil to a depth of at least 4 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply fertilizer directly to surface soil before loosening.
3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

- A. Seeded areas shall be hydro seeded, except small areas that are inaccessible to the hydro seeding equipment, which shall be drill seeded
- B. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- C. Sow temporary seeding at a total rate of:
- D. Late Winter and Early Spring, Annual Rye: (Jan. 1 – Apr. 15): 120 lb./ac.
- E. Sow permanent seeding at a rate of:
 1. Princess 77 Bermuda Grass: 90 lb./ac.
- F. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- G. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 75 lb./1,000 sf to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 1. Anchor straw mulch by crimping into soil with vertical set blade or other suitable mechanical equipment.
- H. Watering:
 1. The mulched and seeded areas shall be sprinkled with water applied in a light spray until the seedbed is thoroughly moist to a depth of 1 inch.
 2. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches. Sprinkling shall be continued during dry weather to ensure a good stand of grass.
- I. Mowing

1. Mowing of the seeded areas shall be the responsibility of the Contractor within the establishment period with approved mowing equipment to a height of two (2) inches when average height of grass becomes three (3) inches.

3.3 SODDING

- A. Entire area to be sodded should be sprayed with the non-selective 41% Glyphosate product. Allow at least forty-eight (48) hours post – herbicide application before tilling and grading begins.
- B. Prepare area according to TURF AREA PREPARATION specification.
- C. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- D. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 1. Lay sod across angle of slopes exceeding 1:3.
 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- E. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.
- F. Grades on the areas to be sodded that have been established previously shall be maintained in a true and even condition.

3.4 TURF MAINTENANCE

- A. The Contractor shall be responsible for the care of the sodded areas while grass is becoming established.
- B. The establishment period shall be one month with adequate average temperature for germination or knitting to occur or as required to obtain a complete stand of mowable grass which is acceptable to the owner.
- C. Immediately after seeding and sodding operations, protect the areas against traffic and other uses by erecting barricades, as required, and by placing approved signs at appropriate intervals until final acceptance by the owner
- D. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- E. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.
- F. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.5 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that complies with requirements and continue maintenance until turf is satisfactory.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plants.
 - 2. Tree-watering devices.

1.2 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- C. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.
- D. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples of each type of mulch.

1.5 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.7 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- B. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, 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 plants during shipping and delivery. Do not drop plants during delivery and handling.
- C. Handle planting stock by root ball.
- D. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.9 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 - 2. Warranty Periods: 1 year after the date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 - 1. Size: 5-gram tablets.
 - 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

- A. Organic Mulch: Shredded hardwood.

2.4 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.5 TREE-WATERING DEVICES

- A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

PART 3 - EXECUTION

3.1 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329115 "Soil Preparation (Performance Specification)."
- B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 2. Excavate approximately three times as wide as ball diameter.
 - 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 - 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

- B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.

3.3 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Backfill: Planting soil or for trees, use amended excavated soil for backfill.
 - 2. Balled and Burlapped Stock: After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and 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.
 - 3. Balled and Potted and Container-Grown Stock: Carefully remove root ball from container without damaging root ball or plant.
 - 4. Fabric Bag-Grown Stock: Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 5. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 6. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: Three for each caliper inch of plant.
 - 7. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.4 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.5 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.6 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

3.7 INSTALLING SLOW-RELEASE WATERING DEVICE

- A. Provide one device for each tree.

3.8 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- E. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- F. At time of Final Acceptance, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.9 MAINTENANCE SERVICE

- A. Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period for Trees and Shrubs: 12 months from date of Final Acceptance.

END OF SECTION 329300

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 GENERAL NOTES

- A. All storm drainage structures, related piping and accessories shall be in accordance with the State of North Carolina Department of Transportation standards, and supplemented with any applicable New Hanover County standards. If discrepancies exist they should be brought to the Engineer's attention immediately.
- B. Refer to construction drawings for number, location and details of all proposed structures and pipes.

1.2 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. Materials, Installation, and Testing shall be in accordance with NCDOT and New Hanover County standards and specifications.

1.3 SUMMARY

- A. Section includes but not limited to the following items and appurtenances shown on drawings and specified in this Section:
 - 1. Pipe and fittings.
 - 2. Inlets and outlets.
- B. Related Sections: The following Sections contain requirements that relate to the Section:
 - 1. Division 31, Section "Earth Moving"
 - 2. Division 03, Section "Cast-In-Place Concrete"

1.4 DEFINITIONS

- A. RCP: Reinforced Concrete Pipe.
- B. NCDOT: North Carolina Department of Transportation.

1.5 SUBMITTALS

- A. Product Data: Manufacturer information describing part, accessories, connections and any standard details.
- B. Manufacturer's Instructions: Special procedures required to install specified products.
- C. Shop Drawings: Indicate Part Sizes, connection sizes, elevations and connection parts.
- D. Manufacturer's Certificate: Products meet or exceed specified requirements.
- E. Qualifications Statements:

1. Qualifications for manufacturer, and installer.
2. Manufacturer's approval of installer.

1.6 FIELD QUALITY-CONTROL REPORTS

- A. Project Record Documents: Record actual locations of catch basins, drop inlets, yard inlets and grate/rim and invert elevations.
- B. Operation and Maintenance Data: Submit any special requirements for maintenance.

1.7 QUALITY ASSURANCE

- A. Perform Work according to State of North Carolina Department of Transportation and the New Hanover County standards.
- B. Fabricator: Company specializing in fabricating products specified in this Section with three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Store according to manufacturer's instructions.
- C. Protect any UV sensitive materials from sunlight by using manufacturer recommendations.

1.9 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 1. Notify Owner's Representative no fewer than (72) hours in advance of proposed interruption of service.
 2. Do not proceed with interruption of service without Owner's Representative's written permission
- B. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Pipe and Fittings: ASTM C 76. Pipe and special fittings installed with 10 feet or less cover, but more than 2 feet of cover, over top of pipe shall be Class III, and all other pipe and special fittings shall be Class IV. Basis of acceptance of reinforced concrete pipe shall be the 0.01" crack.
 1. Bell-and-spigot ends and sealant joints with ASTM C 990, bitumen or butyl-rubber sealant.

2.2 PIPE OUTLETS

- A. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-3, screen opening 2 inches.
 - 2. Average Size: NSSGA No. R-4, screen opening 3 inches.
 - 3. Average Size: NSSGA No. R-5, screen opening 5 inches.
- B. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- C. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 EXAMINATION

- A. Verify that excavations, dimensions and elevations are as indicated.
- B. Check pipes for cracks or other compromising features.
 - 1. Any irregularities shall be reported and approved prior to installation.

3.3 PREPARATION

- A. Correct over-excavation with coarse aggregate.
- B. Prepare base in accordance with applicable NCDOT standard.

3.4 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Laser Equipment: Contractor shall utilize laser equipment to insure that piping is installed at elevations and slopes indicated on plans.
- G. Install gravity-flow, non-pressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping at invert elevations as specified in the storm drainage table.
 - 3. Install nonreinforced-concrete piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 4. Install reinforced-concrete piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.5 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure drainage piping according to the following:
 - 1. Join PVC piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
 - 2. Join nonreinforced-concrete piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 - 3. Join reinforced-concrete piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

3.6 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.7 CONNECTIONS

- A. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

- a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 1. Use identification tape or non-detectable warning tape over all underground lines outside building footprint in the backfill approximately 18" to 30" above the service pipe, but a minimum of 10" and a maximum of 24" below finished grade.
 2. Use detectable warning tape over ferrous and nonferrous piping and over edges of underground manholes. Tape all underground lines outside building footprint directly on top of the pipeline and permanently secured to the pipeline at 10' intervals.
 3. Use insulated copper tracer wire or other approved conductor installed adjacent to underground nonmetallic piping and metallic pipe with compression gasket fittings installed underground. Access shall be provided to the tracer wire or the tracer wire shall terminate aboveground at the end of the nonmetallic piping. The tracer wire size shall not be less than 10AWG and the insulation type suitable for direct burial. The tracer wire size shall be copper single-conductor 10AWG minimum and the insulation type suitable for direct burial with type "UF" (Underground Feeder) insulation and shall be continuous along the pipeline passing through the inside of each valve box or manhole.

3.9 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

- a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
- b. Option: Test plastic piping according to ASTM F 1417.
- c. Option: Test concrete piping according to ASTM C 924. C. Leaks and loss in test pressure constitute defects that must be repaired.
- d. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.2 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

SECTION 334913 - STORM DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 GENERAL NOTES

- A. All storm drainage structures, related piping and accessories shall be in accordance with the State of North Carolina Department of Transportation standards and supplemented with any applicable New Hanover County standards. If discrepancies exist, they should be brought to the Engineer's attention immediately.
- B. Refer to construction drawings for number, location and details of all proposed structures and pipes.

1.2 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. Materials, Installation, and Testing shall be in accordance with NCDOT and New Hanover County standards and specifications.

1.3 SUMMARY

- A. Section includes but not limited to the following items and appurtenances shown on drawings and specified in this Section:
 - 1. Catch Basins.
 - 2. Drop Inlets.
 - 3. Junction Boxes/Manholes.
 - 4. Headwalls.
 - 5. Accessories.
 - 6. Stormwater Structures.
 - 7. Concrete.
- B. Related Sections: The following Sections contain requirements that relate to the Section:
 - 1. Division 31, Section "Earth Moving"
 - 2. Division 03, Section "Cast-In-Place Concrete"

1.4 DEFINITIONS

- A. RCP: Reinforced Concrete Pipe
- B. NCDOT: North Carolina Department of Transportation.

1.5 SUBMITTALS

- A. Product Data: Manufacturer information describing part, accessories, connections and any standard details.
- B. Manufacturer's Instructions: Special procedures required to install specified products.

- C. Shop Drawings: Indicate Part Sizes, connection sizes, elevations and connection parts.
- D. Manufacturer's Certificate: Products meet or exceed specified requirements.
- E. Qualifications Statements:
 - 1. Qualifications for manufacturer, and installer.
 - 2. Manufacturer's approval of installer.
- F. Field quality-control reports.
- G. Project Record Documents: Record actual locations of catch basins, drop inlets, yard inlets and grate/rim and invert elevations.
- H. Operation and Maintenance Data: Submit any special requirements for maintenance.

1.6 QUALITY ASSURANCE

- A. Perform Work according to State of North Carolina Department of Transportation and the New Hanover County standards.
- B. Fabricator: Company specializing in fabricating products specified in this Section with three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store according to manufacturer's instructions.
- B. Protect any UV sensitive materials from sunlight by using manufacturer recommendations.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins, drop inlets, and headwalls according to manufacturer's written rigging instructions.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner's Representative no fewer than (72) hours in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Owner's Representative's written permission.
- B. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 CATCH BASINS

- A. All catch basins to be precast in accordance with the NCDOT standard specifications.

- B. Catch Basins Lids and Frames:
 - 1. Materials: Cast Iron
 - 2. Lid: Shall be in accordance with applicable NCDOT standard detail as noted.
 - 3. Nominal Lid and Frame Size: *Varies*, see signed construction drawings.
- C. Connections: All connections to be in accordance with the NCDOT standard specifications.

2.2 DROP INLETS

- A. All drop inlets to be precast in accordance with the NCDOT standard specifications.
- B. Drop inlet Lids and Frames
 - 1. Materials: Cast Iron
 - 2. Lid: Shall be in accordance with applicable NCDOT standard specifications.
 - 3. Nominal Lid and Frame Size: *Varies*, see signed construction drawings.
- C. Connections: All connections to be in accordance with the NCDOT standard specifications.

2.3 JUNCTION BOXES/MANHOLES

- A. Materials:
 - 1. Reinforced Concrete. To be precast in accordance with the applicable NCDOT standard specifications.
- B. Connections:
 - 1. Connections to be minimum soil-tight.
 - 2. All connections to be in accordance with NCDOT standard specifications.
- C. Lids and Frames: Shall conform to NCDOT standard specifications.

2.4 HEADWALLS

- A. Materials:
 - 1. Reinforced concrete in accordance with North Carolina Railroad standards.
- B. Connections:
 - 1. Connections to be minimum soil-tight.
 - 2. All connections to be in accordance with Standard Specifications and New Hanover County Standards.
 - 3. In Bored and Jacked scenarios, casing and carrier pipe shall be restrained, as to prevent slipping or other movement.
- C. Design:
 - 1. Design of headwall to be completed by registered Professional Engineer licensed in North Carolina.
 - 2. Contractor to submit shop drawings to Engineer and Owner for approval. Engineer to only approve shop drawings on the basis of dimensions and size. Engineer not responsible for any footing, shoring or structural aspect of headwall.

2.5 ACCESSORIES

- A. Geotextile Fabric:
 - 1. Shall conform to AASHTO M288.
 - 2. Shall be Class 1, and non-biodegradable.
- B. Any other required accessories for installation shall be engineer approved prior to installation.

2.6 STORMWATER STRUCTURES

- A. Cast-in-Place Concrete, Stormwater Structures: Construct of reinforced-concrete bottom, walls, and top; according to ASTM C 890 structural loading; of depth, shape, dimensions, and appurtenances indicated.
 - 1. Anti-Floatation Block: Can either be cast-in-place or precast
 - a. If cast-in-place prior to constructing, the contractor shall insure the weight of the entire riser structures meets minimum specifications provided on Drawings, and shall submit shop drawings to the Engineer for review denoting the following:
 - 1) Steel reinforcement
 - 2) Connection mechanism to join anti-floatation block with riser section.
 - b. If precast, the anti-floatation block shall be included as part of the precast riser shop drawing submittals to the Engineer for review. It shall meet minimum specifications provided on Drawings.
 - 2. Concrete Collar: Shall connect to riser structure and anti-floatation block to form a watertight connection between outlet barrel and riser structure. It shall meet minimum specifications provided on Drawings.
- B. Steps: Provide steps as shown on the Drawings in manholes, risers, transition cones, and transition top sections in accordance with NCDOT STD 840.66. Steps shall be spaced at 16" O.C.
- C. Emergency drawdown pipe shall be a M&H style 1820 eccentric valve or approved equal. This valve is in accordance with AWWA C-540 Sec 5.5, and shall be operable from top of outlet structure via a handwheel. Refer to valve specifications at the end of this section.
- D. Trash rack: Prior to ordering, the contractor shall submit trash rack shop drawings to the Engineer for review. A minimum 2-foot x 3-foot access hatch opening is required and shall be centered over access steps. Trash rack shall meet minimum specifications provided on Drawings.
- E. Spillway Filter: Refer to installation procedures specified in Section 3.3.B.
 - 1. Stone to be fine aggregate, natural, or manufactured sand meeting the requirements of ASTM C33.
 - 2. Collector Pipe shall be smooth wall, schedule 80 PVC, 4-inch nominal diameter with minimum 0.25-inch diameter perforations.
 - 3. Cleanout and Outlet Pipes shall be smooth wall, schedule 80 PVC, 4-inch nominal diameter, solid.
 - 4. Provide elbows, connections, fittings, etc. for piping as required furnished by pipe manufacturer for type of pipe used.
- F. Energy Dissipaters: Refer to Drawings for shape and sizing; Design in accordance with NC Erosion and Sediment Control Planning and Design Manual.

2.7 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 2 percent through manhole.
 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 50 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 EXAMINATION

- A. Verify that excavations, dimensions and elevations are as indicated.
- B. Check structures for cracks or other compromising features.
1. Any irregularities shall be reported and approved prior to installation.

3.3 PREPARATION

- A. Correct over-excavation with coarse aggregate.
- B. Prepare base in accordance with applicable NCDOT standard.

3.4 INSTALLATION

- A. Installation Standards: Install Work according to NCDOT standards and manufacturer recommendations. If discrepancies exist they should be brought to Engineer's attention immediately.

B. Spillway Filter Installation

1. Provide trench width to allow installation of drainage conduit. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system. Trench shall extend at least 2 feet below spillway pipe.
2. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
3. Place supporting layer of drainage course (NCDOT #67 washed stone) as specified on Drawings.
4. Install perforated piping as specified on Drawings for spillway filter subdrainage.
5. Contractor shall provide a watertight seal between the filter fabric and principal spillway pipe.
6. Add drainage course (NCDOT #67 stone) to top of drainage conduits. Spillway filter depth shall be in accordance with the depth specified in the Drawings. Cover drainage conduit as specified on Drawings.
7. Completely overlap both sides of filter fabric above drainage course. Top of overlap shall correspond to seepage direction.
8. Fill to Grade: Fill with satisfactory soil to finish grade. Fill above the filter fabric shall consist of well-compacted clayey soils to prevent down slope run-off from rainfall from entering the drain.
9. Care shall be taken during the drain construction to keep the washed stone clean and free of soil contamination; otherwise, the effectiveness of the drain can be seriously jeopardized.

3.5 FIELD QUALITY CONTROL

- A. Request inspection by Engineer prior to back filling any aggregate.
- B. If inspections indicate that Work does not meet specified requirements, remove Work, replace and request additional inspections.
- C. Provide a signed and sealed as-built survey by a licensed Land Surveyor in North Carolina for all locations, lengths, sizes and inverts of all storm drainage structures and piping. Land surveyor should also indicate any and all underground utilities encountered during excavation, including elevations tied to local control.

3.6 CLEANING

- A. Clean interior of structures of dirt and superfluous materials. Flush with water.

END OF SECTION 334913