

PROJECT MANUAL

Including Specifications for the Construction of:

Currituck Community Park Phase III

Barco, Currituck County, North Carolina



Rivers & Associates, Inc.
Six Forks Place III
353 East Six Forks Road, Suite 230
Raleigh, North Carolina 27609

FOR BIDDING

Date of Issue:

November 25, 2025

1.1 PROJECT

Currituck Community Park Phase III
Barco, Currituck County, NC

1.2 SITE

- A. Firm: Rivers and Associates, Inc.
353 E Six Forks Rd. Ste 230
Raleigh, NC 27609

- B. Landscape Architect: Paul R. Meder, PLA, ASLA

- C. Civil Engineer: J. Stephen Janowski, PE



1.3 ARCHITECT

- A. Firm: Intrepid Architecture, PA
114 East Third St
Greenville, NC 27858

- B. Architect: Danielle J. Hoff, AIA, NCARB



1.4 PLUMBING/MECHANICAL/ELECTRICAL ENGINEER

- A. Firm: Dibble & Pledger, PA
PO Box 1885
Washington, NC 27889
- B. Plumbing/Mechanical/Electrical Engineer: Ronald E. Pledger, PE, LEED AP BD&C



Ronald E. Pledger

8/20/2025

1.5 STRUCTURAL ENGINEER

- A. Firm: NRW Engineering Structural Consultants
748 Lod Dunmore Dr., Suite 101
Virginia Beach, VA 23464
- B. Structural Engineer: Kevin Roomsburg, PE



1.6 IRRIGATION ENGINEER

- A. Firm: Smith Turf & Irrigation
2201 Dabney Road
Richmond, VA 23230
- B. Irrigation Engineer: J. Felice Hall, CID, CLIA



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NOTICE TO BIDDERS

December 4, 2025

Sealed bids will be received by Currituck County until **11:00 am**, local time on **Wednesday, January 21, 2026**, and immediately thereafter publicly opened and read at the Currituck County Historic Courthouse, Board of Commissioners Meeting Room, Second Floor, 153 Courthouse Road, Currituck, North Carolina 27929, for the furnishing of labor, materials and equipment entering into the construction of:

Currituck Community Park Phase III – Baseball/Softball Fields

The Project consists of the construction of two (2) baseball/softball fields and associated parking lots, facilities, services, and amenities, located at 181 Maple Parkway, Barco, North Carolina.

Sealed bids may be mailed to:

County of Currituck
Attn: Trischa Quinlan
153 Courthouse Rd
Currituck, NC 27929

Sealed bids may be hand-delivered to:

Currituck Historic Courthouse Receptionist
153 Courthouse Rd
Currituck, NC 27929

It is the Bidder's responsibility, however, to ensure that its' bid is received at the bid opening location.

Bids shall be lump sum bids based upon the scope of work defined in the Contract Documents, Plans and Specifications.

A Pre-Bid Meeting will be held for all interested bidders at **11:00 a.m.** on **Tuesday, December 16, 2025** at the Currituck Community Park, Baseball/Softball Concession Building, 170 Maple Parkway, Barco, North Carolina, 27917. The meeting will address project specific questions, issues, and bidding procedures. Attendance by prospective bidders is not mandatory.

Questions and/or requests for clarification shall be submitted in writing to Trischa Quinlan, Contracts and Purchasing Agent by email to Bids@CurrituckCountyNC.gov no later than **5:00 pm** on **Thursday, January 8, 2026**.

Complete plans and specifications in digital (pdf) format for this project can be obtained from:

Trischa Quinlan, Contracts & Purchasing Agent
252-232-6073

Bids@CurrituckCountyNC.gov



Each bid shall be accompanied by a cash deposit or a certified check drawn on a bank or trust company authorized to do business in North Carolina, payable to the County of Currituck, in an amount equal to five percent (5%) of the total amount of the bid, as a guarantee that a contract will be entered into. In lieu of cash or a certified check, the Bidder may submit a bid bond in the form prescribed in N.C. Gen. Stat. § 143-129.

The Successful Bidder shall be required to furnish a performance bond and a payment bond for one hundred percent (100%) of the contract amount.

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

All bidders must meet the licensing requirements under Chapter 87 of the N.C. General Statutes. Small Business Entities, Women Owned Businesses, Minority Owned Businesses, Veteran and Service-disabled Veteran Owned Businesses are encouraged to submit bids.

The Owner reserves the right to reject any or all bids and to waive informalities, as it may deem to be in its best interest.

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.03 **Deleted**
- 2.04 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.05 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.
- 2.06 *Electronic Documents*
- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version **10.0** or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot

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and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.
- C. **Deleted**

ARTICLE 3—QUALIFICATIONS OF BIDDERS

To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within **five** days of Owner's request, Bidder must submit the following information:

- A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
- B. A written statement that Bidder is authorized to do business in the state where the Project is located.
- C. Bidder's state or other contractor license number, if applicable.
- D. Subcontractor and Supplier qualification information.
- E. Other required information regarding qualifications.
- F. Official name of Bidder and length of time the organization has been in business under present name.
- G. Address and phone numbers of company office that will manage the Project if different than that provided in the Bid.
- H. Officers of the company. Name and resume of designated project manager and field superintendent. Number of regular employees of the organization.
- I. Financial statements of the Bidder's company for the last three years including assets, liabilities, and other information requested by Owner to establish the Bidder's financial capability to complete the Project. The Bidder must also provide the names, addresses, and telephone numbers for at least two (2) major equipment suppliers, two (2) major material suppliers, and two (2) major subcontractors that the Owner may contact as financial references of the Bidder.

Record of failure to honor contractual commitments, consistent non-payment or payment not completed in a timely manner, and/or unfavorable references will be grounds for the Owner to disqualify the Bidder.
- J. Name and home office address of the Surety proposed and the name and address of the responsible local claim agent.

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- K. Past experience on similar type and size projects within the past five (5) years, in the state for which this Project is to be constructed. Information shall include the list of similar projects, contact names and phone numbers of owners and engineers familiar with the listed projects, scheduled contract time and actual completion time, original and final contract price (include brief explanation of cost overruns and change orders), and subcontractors used on the projects.

Evidence of the lack of experience on similar type and size projects, consistently unfavorable interviews with owners and engineers for the projects, a consistent record of not completing the work on schedule, a record of substantial claims for change orders (all evaluations based upon interviews with the listed contact names), will be grounds for the owner to disqualify the bidder.

- L. A list of all projects the Bidder will have under construction and/or commitment to at the time of the anticipated Notice to Proceed (assume 90 days from the Bid date). This list shall include a complete description of each project including the type, size, structures, major equipment items, and contract amount. This list shall identify the office(s) from which these projects are being coordinated, managed, and staffed. The list shall also identify the number of personnel staffed for each project, along with the total number of personnel for the Bidder's corporation. Evidence that the Bidder is or will be "over-extended" during the Contract Time for this Project will be considered grounds for the Owner to disqualify the Bidder.
- M. A list of all subcontractors and suppliers expected to be utilized on this Project. The list shall include past project experience of the subcontractors and suppliers for similar type and size projects. Include contact names and telephone numbers of the subcontractors and suppliers listed for the Project.

A record of poor financial history with the listed subcontractors and suppliers (as outlined in Item "D" above), failure of the Bidder to provide the proper Contract Documents to the subcontractors and/or suppliers for their bidding purposes, and/or lack of experience on similar type and size projects will be considered grounds for the Owner to disqualify the Bidder. (Electrical subcontractors shall meet Subcontractor Qualifications outlined in Specification Section 16050 – Basic Electrical Materials and Methods)

- N. Statement that bidder is capable of completing the project within the stated time.
- O. The Bidder shall list any and all construction related claims or legal actions by the Contractor against Owners or Engineers in the last five years. Provide a list of any and all construction related claims or legal actions by the Owners, Engineers, or Subcontractors in the last five years.

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Evidence of a pattern of claims and/or legal action either by the Bidder or against the Bidder will be considered grounds for the Owner to disqualify the Bidder.

3.02 **Deleted**

3.03 **Deleted**

3.04 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.05 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

3.06 Bidders are notified that Chapter 87, Article(s) 1, 2, & 4 of the General Statutes of North Carolina, will be observed in receiving and awarding contracts. Bidders for this Project must be licensed in the following classifications and limitations:

A. General: Must have an Unlimited General Contractors license with one of the following classifications.

1. Classifications:

- a. Unclassified
- b. Building

B. Plumbing: Must have a Class I license.

C. HVAC: Must have a Class I, Group 2 or 3 license.

D. Electrical: Must have a minimum of an unlimited classification license.

3.07 Bidders are notified that Chapter 87, Article 7A of the General Statutes of North Carolina, will be observed in receiving and awarding contracts. Contractor shall employ a certified well contractor with the State of North Carolina in accordance with NCAC Title 15A, Chapter 27, Well Contractor Certification Rules, to perform any required well work.

3.08 Bidders shall employ a North Carolina Irrigation Contractors' Licensing Board Certified Irrigation Contractor.

ARTICLE 4—PRE-BID CONFERENCE

4.01 **Deleted**

4.02 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.

4.03 **Deleted**

4.04 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions

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at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 *Site and Other Areas*

- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings. **The Bidder will be responsible for the cost associated with making the copies available.**
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

4. **Deleted**

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

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5.03 *Other Site-related Documents*

- A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

- 1. None

5.04 *Site Visit and Testing by Bidders*

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.
- B. A Site visit is scheduled following the pre-bid conference.
- C. Deleted**
- D. Bidders visiting the Site are required to arrange their own transportation to the Site.
- E. Additional Site visits must be coordinated through the following Owner contact for visiting the Site: Jason Weeks, Currituck County Parks & Recreation Director, 252-232-3007, jason.weeks@currituckcountync.gov. Bidder must conduct the required Site visit during normal working hours.
- F. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- G. Deleted**
- H. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- I. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

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ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder’s examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Trischa Quinlan, Contracts and Purchasing Agent at Bids@CurrituckCountyNC.gov no later than the time specified in the Advertisement for Bids.

7.02 Interpretations or clarifications considered necessary by Owner in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.03 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder’s maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents. Bid security must be at least 5% of the Bidder’s maximum Bid price.

The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner’s damages in the case of a damages-form bond. Such forfeiture will be Owner’s exclusive remedy if Bidder defaults.

8.01 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the

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Contract or to the end of the Bid Acceptance Period as indicated in Article 7 of the Bid, whereupon Bid security furnished by such Bidders will be released.

- 8.02 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

- 9.02 **Deleted**

- 9.03 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND “OR EQUAL” ITEMS

- 10.01 **Deleted**

- 10.02 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Owner within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.

- 10.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 11.01 If requested by the owner or required by the bid documents, the apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for all portions of the Work within five days after Bid opening.

If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a

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Modified to include RD edits from RUS Bulletin 1780-26 (6/16/2020).

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substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

11.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

11.05 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

11.06 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.07A.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
- B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.

12.06 A Bid by an individual must show the Bidder's name and official address.

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- 12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located.
- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure. Bidder's state contractor license number must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Base Bid*

- A. Bidders must submit a Base Bid on a lump sum basis as set forth in the Bid Form.

13.02 **Deleted**

13.03 **Deleted**

13.04 **Deleted**

13.05 *Allowances*

- A. For Unit Price Additional Allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of allowances, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions. Unit Price Additional Allowances are for work additive adjustment in the event work requires additional items described. All work on the plans and specifications should be included in the Base Bid.
- B. For Owner's Contingency Allowance the Contractor shall include the amount of 5% of the Contractor's Base Bid Amount, in accordance with Paragraph 13.02.C of the General Conditions.

13.06 **Deleted**

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ARTICLE 14—SUBMITTAL OF BID

14.01 A Bidder shall submit its bid as indicated in the Notice to Bidders utilizing a two-envelope system.

Envelope One will contain the bid security only and should include “Bid Security” on the face of the envelope. Envelope Two will include the Bid Form and any other documents required to be submitted with the bid. Both envelopes shall be sealed separately.

Envelope One and Envelope Two shall be placed in a sealed envelope with the notation “SEALED BID ENCLOSED” and addressed to the County of Currituck. The project name, and the Bidder’s name and address should also be identified on the face of the envelope.

Bids shall be submitted by the date and time and at the place specified in the Notice to Bidders. Bids received after the date and time specified will not be accepted. The Bidder assumes full responsibility for timely delivery. A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation “BID ENCLOSED.” A mailed Bid must be addressed to the location designated in the Advertisement.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 The Owner will consider modifications to a bid written on the sealed bid envelope by the authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added or deducted from the bid; the amount of the bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed Bid Form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the bid.

A Bidder may withdraw its previously submitted bid prior to the date and time for opening bids. Withdrawn bids may be resubmitted up to the date time for opening bids. Bid security shall be in an amount equal to five percent (5%) of the bid as resubmitted.

Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder’s corporate bylaws, specifically empowered by the Bidder’s charter or similar legally binding document acceptable to the Owner, or by a Power of Attorney, signed and dated, describing the scope and limitations of

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the Power of Attorney. Documentation of such shall be made available to the Owner at the time of seeking modifications or withdrawal of the bid.

A bidder has 72 hours after the bid opening to submit a written request to withdraw its bid without penalty only if the bid was based on a substantial error or omission that was clerical (not a judgement error) and the Bid was submitted in good faith.

Upon receipt of the Bidder's written request, the Owner shall promptly hold a hearing on the Bidder's request. The Owner shall issue a written decision within five (5) days of the hearing.

The Bidder may appeal a denial to withdraw its bid to Superior Court within twenty (20) days of receiving the Owner's decision.

A bidder who withdraws may not bid on the Project if it is rebid.

A bidder who withdraws may not provide materials, equipment or labor to a contractor or subcontractor performing on the Contract from which the Bidder withdrew without prior written permission of the Owner.

ARTICLE 16—OPENING OF BIDS

- 16.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

- 18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.
- 18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.04 *Evaluation of Bids*

- A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

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- B. Bid award will be evaluated on the total of the base bid as selected by the Owner to the extent that project funds are available.
 - C. The Owner reserves the right to award any or all parts of a Contract but separate parts of the same contract will not be awarded to different Contractors.
- 18.05 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 18.06 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.
- 18.07 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose bid is in the best interests of the Project.
- 18.08 In determining the lowest responsible Bidder, Owner shall take into consideration the past performance of Bidder on construction contracts with particular concern given to completion times, quality of work, cooperation with other Contractors, and cooperation with the Owner.
- 18.09 In determining the lowest responsive Bidder, Owner shall take into consideration Bidder's compliance with the requirements of G.S. 143-128.2(c). Failure of the low bidder to furnish affidavit(s) and documentation as required by the Bid Form for compliance with G.S. 143-128.2(c) may constitute a basis for disqualification of the Bid.
- 18.10 Owner reserves the right to reject Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy Owner that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the Work described therein.
- 18.11 Should the Owner adjudge that the apparent low bidder is not the lowest responsible Bidder by virtue of the above information, said apparent low bidder will be so notified and his bid security shall be returned.

ARTICLE 19—BONDS AND INSURANCE

- 19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.
- 19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed

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counterpart of the Agreement to Successful Bidder, together with the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

Sales taxes must be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 22— FEDERAL REQUIREMENTS

Deleted

ARTICLE 23 - CONTRACTS TO BE ASSIGNED

Deleted

BID FORM

Currituck Community Park Phase III – Baseball/Softball Fields

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: **County of Currituck**
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:

- A. Required Bid security;
- B. Evidence of authority to do business in the state of the Project;
- C. Contractor's license number as evidence of Bidder's State Contractor's License;
- D. Required Bidder Qualification Statement with supporting data; and
- E. All required MBE documentation:

In accordance with GS 143-128.2(c), Bidder shall identify on its bid the minority businesses that it will use on the project and the total dollar value of the bid that will be performed by the minority businesses.

Bidder shall list the good faith efforts made to solicit participation in Affidavit A.

A Bidder that will perform all of the work with its own workforce may submit an Affidavit B to that effect in lieu of Affidavit A required above.

- 1. Identification of Minority Business Participation (MB-1)
- 2. Affidavit A, Listing of Good Faith Efforts (MB-2)
- 3. Affidavit B, Intent to Perform Contract with Own Workforce (MB-3)

ARTICLE 3—BASIS OF BID

- 3.01 *Bid*

- A. Bidder will complete the Work in accordance with the Contract Documents for the following price(s) on the Bid Schedule.
- B. All specified allowance(s) are included in the price(s) set forth in the Bid Schedule and have been computed in accordance with Paragraph 13.02 of the General Conditions.

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- C. Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.
- D. Bidder acknowledges that:
 - 1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
 - 2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

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BID SCHEDULE

The undersigned bidder, having carefully investigated the existing conditions at the project site, and having thoroughly familiarized himself with the Contract Documents as prepared by Rivers & Associates, Inc. and their consultants, dated November 25, 2025, 353 E. Six Forks Road, Suite 230, Raleigh, NC 27609, hereby proposes to provide all necessary labor, equipment, materials, services, etc. to complete the construction of Currituck Community Park Phase III – Baseball/Softball Fields.

BASE BID: _____

Written out in words

(\$ _____)

OWNER'S CONTINGENCY ALLOWANCE: _____

(5% of Base Bid)

Written out in words

(\$ _____)

Unit Price Additional Allowances:

Unit Price Number	Description	Quantity (QTY)	Unit Price (per UOM)	Unit of Measure (UOM)	QTY x Unit Price = Amount
UP-1	Unclassified (undercut) Excavation/ off-site disposal	7,300	\$	CY	\$
UP-2	Contractor Furnished (undercut) Borrow/off-site imported fill	8,000	\$	CY	\$
UP-3	Mirafi 500 X Material/ Purchased/ Installed (or civil engineer approved equivalent)	7,000	\$	SY	\$
UP-4	Drilled Well	100	\$	VF	\$
UP-5	CABC Stone/ Purchased/ Compact in Place	100	\$	TON	\$
UP-6	Tensar Geogrid, TX-5/Purchased/ Installed (or Engineer approved equivalent)	100	\$	SY	\$
UP-7	Silt Fence/ Purchased/ Installed	100	\$	LF	\$
UP-8	S9.5A Superpave Asphalt/ Purchased/ Installed	100	\$	TON	\$

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UP-9	Grass Seed/ Purchased/ Installed	1,000	\$	SF	\$
UP-10	Sod/ Purchased/ Installed	1,000	\$	SF	\$
UP-11	Concrete Sidewalk	100	\$	SY	\$
UP-12	Skinned Infield Material	100	\$	TON	\$
UP-13	Temporary Fence/ Purchased/ Installed	100	\$	LF	\$

Total UP-1 through UP-13 Amounts:

TOTAL UNIT PRICE ADDITIONAL ALLOWANCES: _____

Written out in words

(\$ _____)

TOTAL BID is all work in accordance with the contract documents, including BASE BID, OWNER'S CONTINGENCY ALLOWANCE, and TOTAL UNIT PRICE ADDITIONAL ALLOWANCES:

TOTAL BID: _____

Written out in words

(\$ _____)

List of Subcontractors:

The local government accepts bids from general contractors for the *entire* project and awards to the lowest responsive, responsible bidder, and the general contractor contracts with subcontractors for branches or divisions of work on the project. The bidders must identify on their bids the subcontractors for HVAC, electrical, plumbing and general work. Once the contract is awarded, the general contractor is directly responsible to the local government, and subcontractors are directly responsible to the general contractor. The winning contractor cannot substitute subcontractors unless (i) the contractor determines that a subcontractor's bid is nonresponsive or non-responsible; (ii) a subcontractor refuses to enter into the contract; or (iii) with approval by the local government if the contractor shows good cause for the substitution. [G.S. 143-128(d)]

COMPANY NAME AND ADDRESS

HVAC Subcontractor

Electrical Subcontractor

Currituck Community Park Phase III – Baseball/Softball Fields

Plumbing Subcontractor _____

General Work Subcontractor _____
(as applicable) _____

ARTICLE 4—DELETED

ARTICLE 5—DELETED

ARTICLE 6—TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 **Deleted**
- 6.03 **Deleted**
- 6.04 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.
- 6.05 Refer to the Agreement for Milestones that must be met and liquidated damages in the event of failure to complete the Work within the Contract Times for the Milestones.

ARTICLE 7—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

- 7.01 *Bid Acceptance Period*
- A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.
- 7.02 *Instructions to Bidders*
- A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.
- 7.03 *Receipt of Addenda*
- A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 8—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

8.01 *Bidder’s Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder’s (Contractor’s) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Owner is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

Currituck Community Park Phase III – Baseball/Softball Fields

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

Address for giving notices:

Bidder's Contact:

Name:

(typed or printed)

Title:

(typed or printed)

Phone:

Email:

Address:

Bidder's Contractor License No.: (if applicable)

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CONTRACTOR'S QUALIFICATION STATEMENT

The undersigned hereby authorizes any person, firm, or corporation to furnish any information requested by the OWNER and/or ENGINEER in verification of the information stated in the attached qualifications.

I, the undersigned, affirm that the information provided is true and correct to the best of my knowledge and belief.

Dated this _____ day of _____, 20____.

BIDDER: _____

By: _____
(Signed)

Name: _____
(Please print or type)

Title: _____

NORTH CAROLINA
_____ County

I, _____, a Notary Public for _____ County, North Carolina, do hereby certify that _____ personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the _____ day of _____, 20____.

(Official Seal)

Notary Public

My commission expires _____, 20____.

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BID BOND (PENAL SUM FORM)

Bidder Name: _____ Address <i>(principal place of business)</i> : _____ 	Surety Name: _____ Address <i>(principal place of business)</i> : _____
Owner Name: _____ Address <i>(principal place of business)</i> : _____ 	Bid Project <i>(name and location)</i> : _____ Bid Due Date: _____
Bond Penal Sum: _____ Date of Bond: _____	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
_____ <i>(Full formal name of Bidder)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i>	

Currituck Community Park Phase III- Baseball/Softball Fields

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner, or
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

I, _____
(Name of Bidder)

[illegible]

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

Currituck Community Park Phase III – Baseball/Softball Fields

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

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.

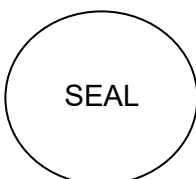
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure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

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

Notary Public _____

My commission expires _____

Currituck Community Park Phase III – Baseball/Softball Fields

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

**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

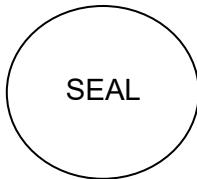
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The 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 North Carolina, County of _____

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

Notary Public _____

My commission expires _____

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

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 minority businesses as defined in GS143-128.2(g) 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

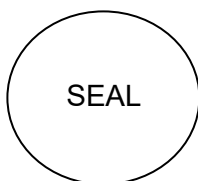
Name and Phone Number	*Minority Category	Work description	Dollar Value

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

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 North Carolina, 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 minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

(Name of Bidder)

Affidavit of: _____

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	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**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions.

Examples of documentation include, but are not limited to, the following evidence:

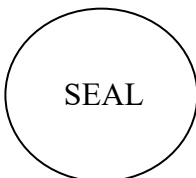
- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to 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.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. 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.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster.
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. 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.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, County of _____

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

Notary Public _____

My commission expires _____

MINORITY BUSINESS GUIDELINES

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 Owner 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 Owner 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 Owner 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 Owner whether to terminate the contract for breach or not.

In determining whether a contractor has made Good Faith Efforts, the Owner 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.

Currituck Community Park Phase III – Baseball/Softball Fields

- (10) Providing quick pay agreements and policies to enable minority contractors and supplies to meet cash-flow demands.

Currituck Community Park Phase III – Baseball/Softball Fields

NOTICE OF AWARD

Date of Issuance:

Owner:

Owner's Project No.:

Engineer:

Engineer's Project No.:

Project:

Contract Name:

Bidder:

Bidder's Address:

You are notified that Owner has accepted your Bid dated **[date]** for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

[Describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is \$**[Contract Price]**. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

[Number of copies sent] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner one electronic counterpart of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): **[Describe other conditions that require Successful Bidder's compliance]**

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **County of Currituck**

Contractor:

By (signature): _____

By (signature): _____

Name (printed): _____

Name (printed): _____

Title: _____

Title: _____

Copy: Engineer

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **County of Currituck** (“Owner”) and **[INSERT CONTRACTOR]** (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: Construction of two (2) athletic fields and associated parking lots, facilities, services and amenities.

ARTICLE 2—THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: The third phase of Currituck Community Park located in the undeveloped southwest section of the property, in Barco, NC.

ARTICLE 3—ENGINEER

- 3.01 The Owner has retained Rivers & Associates, Inc. (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.
- 3.02 The part of the Project that pertains to the Work has been designed by Engineer and Engineer’s consultants: Intrepid Architecture, PA; NRW Engineering, P.C; Dibble & Pledger, PA.; Smith Turf & Irrigation, Musco Sports Lighting, LLC.
- 3.03 Once the Notice of Award has been issued, the Owner may assume all or part of the responsibilities of the Engineer.

ARTICLE 4—CONTRACT TIMES

- 4.01 *Time is of the Essence*
- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.
- 4.02 *Contract Times: Days*
- A. The Work will be substantially complete within **365** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and

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Modified to include RD edits from RUS Bulletin 1780-26 (6/16/2020).

Currituck Community Park Phase III – Baseball/Softball Fields

completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **395** days after the date when the Contract Times commence to run.

4.03 *Milestones*

- A. Parts of the Work must be substantially completed on or before the following Milestone(s):
1. Milestone 1: As per Currituck County's agreement with the U.S. Fish & Wildlife service, via the U.S Army Corps of Engineers, for the protection of the Northern Long-Eared Bat (NLEB) population, Contractor shall not cut any trees during the following periods of time: December 15 – February 14; April 15 – July 31.

4.04 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. *Substantial Completion:* Contractor shall pay Owner **\$700** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$500** for each day that expires after such time until the Work is completed and ready for final payment.
 3. Contractor shall pay Owner all fines, penalties, fees, interest, administrative staff time and expenses, attorneys fees, other costs, etc. that may be incurred by the Owner due to the Contractor cutting trees onsite during the time periods prohibited in Milestone 1.
 4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.
- C. **Deleted**

Currituck Community Park Phase III – Baseball/Softball Fields

4.05 Deleted

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment 25 Days after presentation of the Application for Payment to Owner with Engineer's recommendation, during performance of the Work as provided in Paragraph 6.02.A.1, below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. 95 percent of the value of the Work completed (with the balance being retainage).

1) If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, and Contractor has provided written consent of surety, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage. The 50 percent of work completed shall be based on Contractor's pay request with off-site materials excluded and a maximum of 20 percent of on-site stored materials included; and

b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage) but delivered and suitably stored in a location and manner agreed to in writing and pursuant to Paragraph 15.01.B.2 of the General Conditions.

B. Upon Substantial Completion of the entire construction to be provided under the construction Contract Documents, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by

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Currituck Community Park Phase III – Baseball/Softball Fields

Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price as recommended by Engineer in accordance with Paragraph 15.06 of the General Conditions, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages.

6.04 *Consent of Surety*

- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at the rate of zero percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 - 1. This Agreement.
 - 2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 - 3. General Conditions.
 - 4. Supplementary Conditions.
 - 5. Specifications as listed in the table of contents of the project manual.
 - 6. Drawings (not attached but incorporated by reference) consisting of +/-72 sheets with each sheet bearing the following general title: **Currituck Community Park – Phase III- Baseball/Softball Fields**
 - 7. Addenda (numbers [number] to [number], inclusive).
 - 8. Ad for Bids for Construction Contract
 - 9. Instruction to Bidders
 - 10. Bid Form for Construction Contract
 - 11. E-Verify Certification
 - 12. Iran Divestment Act Certification
 - 13. C626 Notice of Acceptability

Currituck Community Park Phase III – Baseball/Softball Fields

14. Contractors Qualification Statement
 15. C430 Bid Bond Penal Sum Form
 16. MB Forms
 17. MB Guidelines
 18. C510 Notice of Award
 19. Certificate of Liability Insurance
 20. Certificate of Financial Officer
 21. Certificate of Owner's Attorney
 22. C620 Application for Payment
 23. C625 Certificate of Substantial Completion
 24. Waiver of Lien
 25. Geotechnical Report
 26. Owner's Sales Tax form
 27. Documentation submitted by Contractor prior to Notice of Award (pages ____ to ____, inclusive).
 28. USACE General Permit Verification, SAW-2020-01450
 29. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 30. Statement of Special inspections
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

Currituck Community Park Phase III – Baseball/Softball Fields

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

Currituck Community Park Phase III – Baseball/Softball Fields

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 **Deleted**

Currituck Community Park Phase III – Baseball/Softball Fields

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on **[indicate date on which Contract becomes effective]** (which is the Effective Date of the Contract).

Owner:

County of Currituck

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

(If [Type of Entity] is a corporation, attach evidence of authority to sign. If [Type of Entity] is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Contractor:

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

License No.:

(where applicable)

State:

This document is a Modified version of EJCDC® C-520, Agreement between Owner and Contractor for Construction Contract (Stipulated Price).

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Modified to include RD edits from RUS Bulletin 1780-26 (6/16/2020).

NOTICE TO PROCEED

Owner: County of Currituck Owner's Project No.: _____
Engineer: Rivers and Associates, Inc Engineer's Project No.: 2022109
Contractor: _____ Contractor's Project No.: _____
Project: _____
Contract Name: _____
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement: **[Select one of the following two alternatives, insert dates or number of days, and delete the other alternative.]**

The date by which Substantial Completion must be achieved is **[date for Substantial Completion, from Agreement]**, and the date by which readiness for final payment must be achieved is **[date for readiness, from Agreement]**.

[or]

The number of days to achieve Substantial Completion is **[number of days, from Agreement]** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is **[number of days, from Agreement]** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

Owner: County of Currituck Contractor: _____
By (signature): _____ By (signature): _____
Name (printed): _____ Name (printed): _____
Title: _____ Title: _____
Date Issued: _____ Date Issued: _____
Copy: Engineer

PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal: _____

Name of Surety: _____

Name of Contracting Body: **County of Currituck, North Carolina**

Amount of Bond: _____

Project: **Currituck Community Park Phase III**

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

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

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

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

Executed in ____ counterparts.

Witness:

(Proprietorship or Partnership)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Secretary or Asst. Secretary Only)

Witness:

Countersigned:

(N.C. Licensed Resident Agent)

Name and Address - Surety Agency

Surety Company Name and N.C.

Contractor

By: _____

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

(Corporate Seal)

Surety Company

By: _____

Title: _____
(Attorney in Fact)

(Surety Corporate Seal)

PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal:
(Contractor) _____

Name of Surety: _____

Name of Contracting Body: **County of Currituck, North Carolina**

Amount of Bond: _____

Project: **Currituck Community Park Phase III**

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

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

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

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

Executed in ____ counterparts.

Witness:

(Proprietorship or Partnership)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Secretary or Asst. Secretary Only)

Witness:

Countersigned:

(N.C. Licensed Resident Agent)

Name and Address - Surety Agency

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

Contractor

By: _____

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

(CORPORATE SEAL)

Surety Company

By: _____

Title: _____
(Attorney in Fact)

(Surety Corporate Seal)



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

PRODUCER ABC Insurance Agency Street City, State, Zip	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.												
INSURED XYZ Contractor Street City, State, Zip	<table border="1"><thead><tr><th>INSURERS AFFORDING COVERAGE</th><th>NAIC #</th></tr></thead><tbody><tr><td>INSURER A: Name of Insurance Co</td><td></td></tr><tr><td>INSURER B: Name of Insurance Co</td><td></td></tr><tr><td>INSURER C: Name of Insurance Co</td><td></td></tr><tr><td>INSURER D: Name of Insurance Co</td><td></td></tr><tr><td>INSURER E:</td><td></td></tr></tbody></table>	INSURERS AFFORDING COVERAGE	NAIC #	INSURER A: Name of Insurance Co		INSURER B: Name of Insurance Co		INSURER C: Name of Insurance Co		INSURER D: Name of Insurance Co		INSURER E:	
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INSURER C: Name of Insurance Co													
INSURER D: Name of Insurance Co													
INSURER E:													

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADMT INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS												
A	A	GENERAL LIABILITY ☒ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE ☒ OCCUR ☒ Explosion, Collapse Hazard ☒ Underground Hazard GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☒ PROJECT ☐ LOC				<table border="1"><tbody><tr><td>EACH OCCURRENCE</td><td>\$ 1,000,000</td></tr><tr><td>DAMAGE TO RENTED PREMISES (Ea occurrence)</td><td>\$ 50,000</td></tr><tr><td>MED EXP (Any one person)</td><td>\$ 5,000</td></tr><tr><td>PERSONAL & ADY INJURY</td><td>\$ 1,000,000</td></tr><tr><td>GENERAL AGGREGATE</td><td>\$ 2,000,000</td></tr><tr><td>PRODUCTS - COMP/OP AGG</td><td>\$ 2,000,000</td></tr></tbody></table>	EACH OCCURRENCE	\$ 1,000,000	DAMAGE TO RENTED PREMISES (Ea occurrence)	\$ 50,000	MED EXP (Any one person)	\$ 5,000	PERSONAL & ADY INJURY	\$ 1,000,000	GENERAL AGGREGATE	\$ 2,000,000	PRODUCTS - COMP/OP AGG	\$ 2,000,000
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GENERAL AGGREGATE	\$ 2,000,000																	
PRODUCTS - COMP/OP AGG	\$ 2,000,000																	
B		AUTOMOBILE LIABILITY ☒ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☒ HIRED AUTOS ☒ NON-OWNED AUTOS				<table border="1"><tbody><tr><td>COMBINED SINGLE LIMIT (Ea accident)</td><td>\$ 1,000,000</td></tr><tr><td>BODILY INJURY (Per person)</td><td>\$</td></tr><tr><td>BODILY INJURY (Per accident)</td><td>\$</td></tr><tr><td>PROPERTY DAMAGE (Per accident)</td><td>\$</td></tr></tbody></table>	COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000	BODILY INJURY (Per person)	\$	BODILY INJURY (Per accident)	\$	PROPERTY DAMAGE (Per accident)	\$				
COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000																	
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BODILY INJURY (Per accident)	\$																	
PROPERTY DAMAGE (Per accident)	\$																	
		DAMAGE LIABILITY ☐ ANY AUTO				<table border="1"><tbody><tr><td>AUTO ONLY - EA ACCIDENT</td><td>\$</td></tr><tr><td>OTHER THAN EA ACC</td><td>\$</td></tr><tr><td>AUTO ONLY: AGG</td><td>\$</td></tr></tbody></table>	AUTO ONLY - EA ACCIDENT	\$	OTHER THAN EA ACC	\$	AUTO ONLY: AGG	\$						
AUTO ONLY - EA ACCIDENT	\$																	
OTHER THAN EA ACC	\$																	
AUTO ONLY: AGG	\$																	
C		EXCESS/UMBRELLA LIABILITY ☒ OCCUR ☐ CLAIMS MADE ☐ DEDUCTIBLE ☐ RETENTION \$				<table border="1"><tbody><tr><td>EACH OCCURRENCE</td><td>\$ 5,000,000</td></tr><tr><td>AGGREGATE</td><td>\$ 5,000,000</td></tr><tr><td></td><td>\$</td></tr><tr><td></td><td>\$</td></tr><tr><td></td><td>\$</td></tr></tbody></table>	EACH OCCURRENCE	\$ 5,000,000	AGGREGATE	\$ 5,000,000		\$		\$		\$		
EACH OCCURRENCE	\$ 5,000,000																	
AGGREGATE	\$ 5,000,000																	
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	\$																	
D		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				<table border="1"><tbody><tr><td>☒ WC STATUTORY LIMITS ☐ OTHER</td><td></td></tr><tr><td>E.L. EACH ACCIDENT</td><td>\$ 500,000</td></tr><tr><td>E.L. DISEASE - EA EMPLOYEE</td><td>\$ 500,000</td></tr><tr><td>E.L. DISEASE - POLICY LIMIT</td><td>\$ 500,000</td></tr></tbody></table>	☒ WC STATUTORY LIMITS ☐ OTHER		E.L. EACH ACCIDENT	\$ 500,000	E.L. DISEASE - EA EMPLOYEE	\$ 500,000	E.L. DISEASE - POLICY LIMIT	\$ 500,000				
☒ WC STATUTORY LIMITS ☐ OTHER																		
E.L. EACH ACCIDENT	\$ 500,000																	
E.L. DISEASE - EA EMPLOYEE	\$ 500,000																	
E.L. DISEASE - POLICY LIMIT	\$ 500,000																	
		OTHER																

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

Coverage applies to (Project Name and Contract No.). Certificate holder is named as Additional Insured, per attached ISO Form CG 20 10 11-85 or equivalent. Waiver of Subrogation is added by endorsement.

CERTIFICATE HOLDER

Contractor/Owner/Engineer Street City, State, Zip	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL _____ DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE

Currituck Community Park Phase III – Baseball/Softball Fields

CERTIFICATE OF FINANCE OFFICER

Provisions for the payment of the monies to fall due under this agreement has been made by appropriation duly made or by bonds or notes duly authorized, as required by the "Local Government Budget and Fiscal Control Act."

Finance Officer

Date

Currituck Community Park Phase III – Baseball/Softball Fields

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____,

the duly authorized and acting legal representative of _____

_____, do hereby certify as follows:

I have examined the attached Contract(s) and Performance and Payment Bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions, and provisions thereof.

Attorney Signature

Print Name

Date _____

Currituck Community Park Phase III

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____	Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____																																				
Application No.: _____ Application Date: _____ Application Period: From _____ to _____																																					
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">1. Original Contract Price</td> <td style="width: 10%; text-align: right;">\$</td> <td style="width: 20%; text-align: right;">-</td> </tr> <tr> <td>2. Net change by Change Orders</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td>3. Current Contract Price (Line 1 + Line 2)</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td>4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td colspan="3">5. Retainage</td> </tr> <tr> <td style="padding-left: 20px;">a. _____ X \$ - Work Completed =</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td style="padding-left: 20px;">b. _____ X \$ - Stored Materials =</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td style="padding-left: 20px;">c. Total Retainage (Line 5.a + Line 5.b)</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td>6. Amount eligible to date (Line 4 - Line 5.c)</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td>7. Less previous payments (Line 6 from prior application)</td> <td></td> <td></td> </tr> <tr> <td>8. Amount due this application</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> <tr> <td>9. Balance to finish, including retainage (Line 3 - Line 4 + Line 5.c)</td> <td style="text-align: right;">\$</td> <td style="text-align: right;">-</td> </tr> </table>		1. Original Contract Price	\$	-	2. Net change by Change Orders	\$	-	3. Current Contract Price (Line 1 + Line 2)	\$	-	4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-	5. Retainage			a. _____ X \$ - Work Completed =	\$	-	b. _____ X \$ - Stored Materials =	\$	-	c. Total Retainage (Line 5.a + Line 5.b)	\$	-	6. Amount eligible to date (Line 4 - Line 5.c)	\$	-	7. Less previous payments (Line 6 from prior application)			8. Amount due this application	\$	-	9. Balance to finish, including retainage (Line 3 - Line 4 + Line 5.c)	\$	-
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Contractor's Certification The undersigned Contractor certifies, to the best of its knowledge, the following: (1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment; (2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and (3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.																																					
Contractor: _____ Signature: _____ Date: _____																																					
Recommended by Engineer By: _____ Title: _____ Date: _____ Approved by Funding Agency By: _____ Title: _____ Date: _____	Approved by Owner By: _____ Title: _____ Date: _____ By: _____ Title: _____ Date: _____																																				

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____						Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____		
Application No.: _____		Application Period: From _____ to _____		Application Date: _____				
A	B	C	D	E	F	G	H	I
Item No.	Description	Scheduled Value (\$)	Work Completed		Materials Currently Stored (not in D or E) (\$)	Work Completed and Materials Stored to Date (D + E + F) (\$)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) (\$)
			(D + E) From Previous Application (\$)	This Period (\$)				
Original Contract								
						-		-
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						-		-
Original Contract Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____						Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____		
Application No.: _____		Application Period: From _____ to _____		Application Date: _____				
A	B	C	D	E	F	G	H	I
Item No.	Description	Scheduled Value (\$)	Work Completed		Materials Currently Stored (not in D or E) (\$)	Work Completed and Materials Stored to Date (D + E + F) (\$)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) (\$)
			(D + E) From Previous Application (\$)	This Period (\$)				
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Change Order Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -
Original Contract and Change Orders								
Project Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner: _____

Engineer: _____

Contractor: _____

Project: _____

Contract: _____

Owner's Project No.: _____

Engineer's Project No.: _____

Contractor's Project No.: _____

Application No.: _____		Application Period: _____		From _____		to _____		Application Date: _____			
A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
Original Contract											
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Contractor's Application for Payment

Owner's Project No.:	
Engineer's Project No.:	
Contractor's Project No.:	

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				

Original Contract and Change Orders							
Project Totals	\$ -		\$ -	\$ -	\$ -		\$ -

Contractor's Application for Payment

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CONTRACTOR'S SALES TAX REPORT

NC STATE & LOCAL SALES TAXES PAID

OWNER: COUNTY OF CURRITUCK

PROJECT:

CONTRACTOR:

FOR PERIOD:

ADDRESS:

THROUGH:

CITY, STATE, ZIP:

JOB NUMBER:

[illegible]

I, _____, certify that the foregoing statement of applicable sales taxes paid in connection with the referenced contract is true to the best of my knowledge and belief.

Signature

Notarized by: _____

State of _____ County of : _____

Date: _____

Subscribed and sworn to before me this _____ day of _____.

Notary Public: _____

My commission expires _____

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:

Engineer:

Contractor:

Project:

Contract Name:

Owner's Project No.:

Engineer's Project No.:

Contractor's Project No.:

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By (signature):

Name (printed):

Title:

Currituck Community Park Phase III – Baseball/Softball Fields

CONTRACTOR'S
FINAL WAIVER OF LIEN,
RELEASE, AFFIDAVIT, AND INDEMNIFICATION AGREEMENT

FROM: _____

(hereinafter "**Undersigned**" as Contractor)

TO: _____

(hereinafter "**Owner**")

RE: _____

The Undersigned, in consideration of any and all previous payments made to it, (including the full and final payment) and other good and valuable considerations, hereby waives and releases all actions, debts, claims and demands against the Engineer, Owner, and its lender, title insurer, if any, their officers agents and representatives, on account of any and all work, including but not limited to: Labor; professional design or surveying services; materials; appliances; equipment; machinery; fixtures; or furnishings ("Work") performed and furnished by it, in connection with the making of improvements on or beneath the Real Property and for the Project of the Owner as referenced above; and

Hereby waives any and all right to have a mechanic's, laborer's, materialman's or other liens by virtue of the laws of North Carolina or any amendment of said laws, and all right to file any such liens or assert claims presently or in the future against bonds, funds, the Project or said Real Property relating to the Work; and

Hereby agrees to promptly: withdraw any claim against bonds; pay and release of record any and all mechanic's, laborers, materialman's and other liens filed or claimed by others in connection with the Undersigned's Work on the Project, which may now or in the future affect said Real Property: and to defend, indemnify and save Owner harmless from any claim, liability or expense (including attorney's fees) because of any such claims or liens or the enforcement thereof.

The Undersigned, on oath, states: that no UCC Financing Statement, security interest, conditional bill of sale or retention of title agreement, has been given or executed by the Undersigned for or in connection with any material, appliances, machinery, fixtures or furnishings placed upon or installed in the Real Property and Project:

Currituck Community Park Phase III – Baseball/Softball Fields

It is further understood that this document is submitted to the Owner for its reliance and assurance to others that all liens and claims relating to the Work furnished by the Undersigned are paid or resolved.

It is further understood and agreed that this document also constitutes an “instrument of satisfaction” which the Owner may exhibit, whereupon the Clerk of Superior Court shall cancel of record any and all liens by or through the Undersigned in connection with the Real Property and Project, all as provided by N.C.G.S. §44A-16(2) and as may be amended.

(Name of First Tier Contractor)

By: _____

(Print) _____

Dated: _____

Title: _____

Authorized Representative

STATE OF NORTH CAROLINA

COUNTY OF _____

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

NOTARY PUBLIC

My Commission Expires:

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract

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Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions,

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including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

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- 32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
- 33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
- 34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
- 35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.
- 36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
- 37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
- 38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
- 39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
- 40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
- 41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
- 42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

Currituck Community Park Phase III – Baseball/Softball Fields

thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

- 43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
- 44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
- 45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
- 46. *Technical Data*
 - a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
- 47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
- 48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
- 49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day*: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

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4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

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2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

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2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

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3.02 Reference Standards

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in

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resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

- a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

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ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption,

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and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.
- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
 - 1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 - 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 - 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
 - 1. The circumstances that form the basis for the requested adjustment;
 - 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 - 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 - 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 - 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

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Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
- 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b)

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promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 Subsurface and Physical Conditions

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

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- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 Differing Subsurface or Physical Conditions

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
 - 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
 - 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 - 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 - 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

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- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 Underground Facilities

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;
 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary, issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

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- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 - 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

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5.06 Hazardous Environmental Conditions at Site

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
 2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely

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- obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
 - G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
 - H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
 - I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
 - J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to

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indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

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6.02 Insurance—General Provisions

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party’s full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party’s obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner’s option, may purchase and maintain Owner’s own liability insurance. Owner’s liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner’s liability policies for any of Contractor’s obligations to the Owner, Engineer, or third parties.

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H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.
- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
1. include at least the specific coverages required;

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2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);
 4. not seek contribution from insurance maintained by the additional insured; and
 5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

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- C. *Property Insurance for Substantially Complete Facilities:* Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.
 - 1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 - 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to

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Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

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ARTICLE 7—CONTRACTOR’S RESPONSIBILITIES

7.01 *Contractor’s Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor’s responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor’s expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor’s determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor’s employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor’s own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner’s written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

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- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 “Or Equals”

- A. *Contractor’s Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an “or equal” item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
 - b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete

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and Engineer determines that the proposed item is an “or-equal,” which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request will result in any change in Contract Price. The Engineer’s denial of an “or-equal” request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor’s Request; Governing Criteria:* Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

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- 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 Concerning Subcontractors and Suppliers

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

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- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

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- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

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7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

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2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 Hazard Communication Programs

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

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7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

- a. Contractor shall submit the number of copies required in the Specifications.

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- b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

- a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

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8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance and resubmit an acceptable document.
2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.

- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

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- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or
 - 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses,

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damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;

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2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay,

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disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 Coordination

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 Legal Relationships

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

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2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to the Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

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9.06 Insurance

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 Change Orders

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 Inspections, Tests, and Approvals

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 Limitations on Owner's Responsibilities

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 Undisclosed Hazardous Environmental Condition

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 Evidence of Financial Arrangements

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 Safety Programs

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 Owner's Representative

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 Visits to Site

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to

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make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.
- E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

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10.07 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

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11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.
- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract

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Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 - 1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 - 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 - 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

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- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

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11.09 *Change Proposals*

A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
5. *Binding Decision:* Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

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- C. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion:* Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 Notification to Surety

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 Claims

- A. *Claims Process:* The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 - 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

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D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the

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locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not

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be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

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- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:
1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 6. Expenses incurred in preparing and advancing Claims.
 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.
- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish

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and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance:* Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

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E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

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2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 Defective Work

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

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14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this

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right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's

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request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

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4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

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- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 Contractor's Warranty of Title

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 Substantial Completion

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

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submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

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significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 Final Inspection

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 Final Payment

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects or will so pass upon final payment.

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- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 Waiver of Claims

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

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appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim or appealed under the provisions of Article 17.

15.08 Correction Period

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs,

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- losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
 - G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 25 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due,

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Contractor may, 7 25 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

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18.03 Cumulative Remedies

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 Limitation of Damages

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 No Waiver

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 Survival of Obligations

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 Controlling Law

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 Assignment of Contract

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 Successors and Assigns

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 Headings

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC-1.01.A.3 - Add the following language at the end of last sentence of Paragraph 1.01.A.3:

The Application for Payment form to be used on this Project is attached.

SC-1.01.A.8 – Add the following at the end of the Paragraph 1.01.A.8:

The Change Order form to be used on this Project is EJCDC C-941 (2018).

SC1.01.A.-22 - Add the following at the end of Paragraph 1.01.A.22:

The ENGINEER's consultant(s) are:

Dibble and Pledger, PA for Electrical, Mechanical and Plumbing Engineering

Interpid Architecture for Architecture, PA

NRW Engineering for Structural Engineering

Smith Turf and Irrigation for Irrigation Engineering

Musco Lighting, LLC

Refer to the Agreement, Article 3 – Engineer, for conditions, if any, when the Owner will assume all or part of the duties of the Engineer.

SC-1.01.A.42 - Add the following to Paragraph 1.01.A.42:

"Substantial Completion" means that the facilities are completed to the point that they are suitable for continuous use by Owner, are in a condition that is satisfactory to ENGINEER and that no nuisance or damage to the facilities is created by their continuous use, to satisfaction of ENGINEER. All equipment and facilities shall be installed and operational, or temporary arrangements satisfactory to OWNER shall have been made. All equipment must have been started up, and all performance testing shall have been completed prior to the date of substantial completion.

To be considered substantially complete, the following portions of the Work must be operational and ready for OWNER's continuous use as intended:

Wells and pumps

Irrigation system

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Ballfield turf
Ballfield subsurface drainage system
Baseball facilities and equipment
Scoreboards, signage and flagpole
Concession/restroom building and all associated facilities and equipment
Domestic and fire protection water
Sanitary sewer facilities and equipment
Electrical and lighting facilities and equipment
Storm drainage system, structures, pipes and stormwater control measures
Permanent erosion control and sedimentation measures
Seeded areas
Sidewalks, pavement, and pedestrian access ways constructed to ADA standards
Picnic shelters
Retaining walls
Parking lots
Boardwalks
Fire lane and fire hydrants
Lawns established
Primary and secondary basins

SC-1.01.A.44 - Add the following to the end of Paragraph 1.01.A.44:

The words "Special Provisions," "Special Conditions," and "Supplementary Conditions," wherever they may appear in these Contract Documents and Specifications, are used interchangeably and shall be interpreted to mean either "Special Conditions" or "Supplementary Conditions" which ever may be applicable.

SC-1.01.A.50 – Add the following at the end of the Paragraph 1.01.A.50:

The Work Change Directive form to be used on this Project is EJCDC C-940 (2018).

ARTICLE 2—PRELIMINARY MATTERS

SC-2.02.A - Delete the last sentence and amend the first sentence of Paragraph 2.02.A. to read as follows:

Owner shall furnish to Contractor one electronic copy in electronic portable document format (PDF) of the Contract Documents (including one fully signed counterpart of the Agreement).

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.03.B.1 - Add the following after Paragraph 3.03.B.1.:

In resolving conflicts, errors and discrepancies, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Supplementary Conditions, Special Conditions, General Conditions, Specifications and Drawings. Figure dimensions on drawings shall govern over scale dimensions, and detailed drawings shall govern over general drawings. Any work that may

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reasonably be inferred from the specifications or drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.05.C Amend Paragraph 4.05.C by adding the following subparagraphs:

5. Weather-Related Delays
 - a. If “abnormal weather conditions” as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract Times, such request must be documented by data substantiating each of the following: 1) that weather conditions were abnormal for the period of time in which the delay occurred, 2) that such weather conditions could not have been reasonably anticipated, and 3) that such weather conditions had an adverse effect on the Work as scheduled. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered abnormal weather conditions. Requests for time extensions due to abnormal weather conditions will be submitted to the Engineer within five days of the end of the abnormal weather condition event. It is the responsibility of the Contractor to provide the information listed in SC 4.05.C.5.b.
 - b. The existence of abnormal weather conditions will be determined on a month-by-month basis in accordance with the following:
 - 1) Every workday on which one or more of the following conditions exist will be considered a “bad weather day”:
 - i) Total precipitation (as rain equivalent) occurring between 7:00 p.m. on the preceding day (regardless of whether such preceding day is a workday) through 7:00 p.m. on the workday in question equals or exceeds 0.1 inch of precipitation (as rain equivalent, based on the snow/rain conversion indicated in the table entitled Foreseeable Bad Weather Days; such table is hereby incorporated in this SC-4.05.C by reference.
 - ii) Ambient outdoor air temperature at 11:00 a.m. is equal to or less than the following low temperature threshold: 15 degrees Fahrenheit; or, at 3:00 p.m. the ambient outdoor temperature is equal to or greater than the following high temperature threshold: 100 degrees Fahrenheit.
 - 2) Determination of actual bad weather days during performance of the Work will be based on the weather records measured and recorded by National Weather Service, weather monitoring station at Currituck County Airport, Barco, NC or other weather monitoring service as may be approved by Owner and Engineer.
 - 3) Contractor shall anticipate the number of foreseeable bad weather days per month indicated in the table in Exhibit A—Foreseeable Bad Weather Days.

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- 4) In each month, every bad weather day exceeding the number of foreseeable bad weather days established in the table in Exhibit A—Foreseeable Bad Weather Days will be considered as “abnormal weather conditions.” The existence of abnormal weather conditions will not relieve Contractor of the obligation to demonstrate and document that delays caused by abnormal weather are specific to the planned work activities or that such activities thus delayed were on Contractor’s then-current Progress Schedule’s critical path for the Project.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03.D - Add the following new paragraphs immediately after Paragraph 5.03.D:

- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Geotechnical Engineering Report	Jan. 31, 2025	Subsurface Exploration

- F. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
Topographic Survey	6/25/2025	[Identify Technical Data] Existing Conditions
Existing Conditions & Demolition Plan	6/16/2025	Existing Conditions

- G. Reports and drawings identified in SC-5.03.E and SC-5.03.F are included with the Bidding Documents.

SC-5.05.A - Add the following subparagraphs to 5.05.A:

6. locating existing service connections which are not indicated on the drawings;
7. discovering existing underground installations in advance of excavating or trenching, by contacting all local utilities and by prospecting. The CONTRACTOR shall notify NC 811 (1-800-632-4949) at least 72 hours prior to commencing construction in order that existing utilities in the area may be flagged or staked, protecting and maintaining all existing utilities in an operational manner. CONTRACTOR shall note that not all utility owners/operators are members of NC 811, and that notifying NC 811 will not assure that all applicable utilities are located.

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SC-5.06.A.3 - Add the following new paragraphs immediately after Paragraph 5.06.A.3:

4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data
No Reports		

5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
No Drawings		

ARTICLE 6—BONDS AND INSURANCE

SC-6.01.A - Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition).
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition).
3. Performance and payment bonds shall cover all work of the contract including plantings and landscaping.

SC-6.03.C - Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

- D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following:

Dibble & Pledger, P.A.
Rivers & Associates, Inc.
Intrepid Architecture, PA
NRW Engineering, P.C.
Smith Turf & Irrigation
Musco Lighting, LLC
- E. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act (from available sources,

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notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	\$1,000,000
Each accident	\$500,000
Each employee	\$500,000
Policy limit	\$500,000

The Contractor will provide an endorsement to the Contractor's Workers Compensation and Employer's Liability Insurance waiving all rights of subrogation by the Contractor's insurance carrier against the Owner and Engineer.

- F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.

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5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.
- H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
 6. Any limitation or exclusion based on the nature of Contractor’s work.
 7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$2,000,000
Products—Completed Operations Aggregate	\$2,000,000
Personal and Advertising Injury	\$1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$1,000,000

- J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	

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Automobile Liability	Policy limits of not less than:
Each Person	\$1,000,000
Each Accident	\$1,000,000
Property Damage	
Each Accident	\$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$1,000,000

- K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$2,000,000
General Aggregate	\$2,000,000

- L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of **\$3,000,000** after accounting for partial attribution of its limits to underlying policies, as allowed above.
- M. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	\$ N/A
General Aggregate	\$ N/A

- N. *Contractor's Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The

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retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	\$ 2,000,000
Annual Aggregate	\$ 2,000,000

- O. *Railroad Protective Liability Insurance:* Prior to commencing any Work within 50 feet of railroad-owned and controlled property, Contractor shall (1) endorse its commercial general liability policy with ISO CG 24 17, removing the contractual liability exclusion for work within 50 feet of a railroad, (2) purchase and maintain railroad protective liability insurance meeting the following requirements, (3) furnish a copy of the endorsement to Owner, and (4) submit a copy of the railroad protective policy and other railroad-required documentation to the railroad, and notify Owner of such submittal.

Railroad Protective Liability Insurance	Policy limits of not less than:
Each Claim	\$ N/A
Aggregate	\$ N/A

- P. *Unmanned Aerial Vehicle Liability Insurance:* If Contractor uses unmanned aerial vehicles (UAV—commonly referred to as drones) at the Site or in support of any aspect of the Work, Contractor shall obtain UAV liability insurance in the amounts stated; name Owner, Engineer, and all individuals and entities identified in the Supplementary Conditions as additional insureds; and provide a certificate to Owner confirming Contractor's compliance with this requirement. Such insurance will provide coverage for property damage, bodily injury or death, and invasion of privacy.

Unmanned Aerial Vehicle Liability Insurance	Policy limits of not less than:
Each Claim	NA
General Aggregate	NA

- Q. *Other Required Insurance:*

Contractual Liability	Policy limits of not less than:
Bodily Injury: Each Person	\$1,000,000
Bodily Injury: Each Accident:	\$1,000,000
Property Damage: Each Accident	\$1,000,000
Property Damage: Annual Aggregate	\$1,000,000

- R. Contractor shall name the "County of Currituck" as an additional insured on all insurance policies. The certificate holder shall be listed as: County of Currituck, 153 Courthouse Road, Currituck, NC 27929.

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SC-6.04.A - Delete Paragraph 6.04.A and substitute the following in its place:

A. *Installation Floater*

1. Contractor shall provide and maintain installation floater insurance on a broad form or “all risk” policy providing coverage for materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work (“Covered Property”). Coverage under the Contractor’s installation floater will include loss from covered “all risk” causes (perils) to Covered Property:
 - a. of the Contractor, and Covered Property of others that is in Contractor’s care, custody, and control;
 - b. while in transit to the Site, including while at temporary storage sites;
 - c. while at the Site awaiting and during installation, erection, and testing;
 - d. continuing at least until the installation or erection of the Covered Property is completed, and the Work into which it is incorporated is accepted by Owner.
2. The installation floater coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable.
3. The installation floater coverage will be in an amount sufficient to protect Contractor’s interest in the Covered Property. The Contractor will be solely responsible for any deductible carried under this coverage.
4. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

SC-6.04 – Add the following to Paragraph 6.04:

F. *Builder’s Risk Requirements:* The builder’s risk insurance must:

1. be written on a builder’s risk “all risk” policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).
 - a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
 - b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder’s risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.

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2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
 4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 5. extend to cover damage or loss to insured property while in transit.
 6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.
 7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.
 8. include performance/hot testing and start-up, if applicable.
 9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.
 10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds."
- G. *Builder's Risk and Other Property Insurance Deductibles:* The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

SC-7.03.C - Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be 8:00 a.m. to 5:00 p.m.
2. Whether during or beyond normal working hours, Contractor shall observe and operate within the limits of the Currituck County Noise Ordinance and all other applicable codes, laws and guidelines.
3. Except during temporary utilities construction in the public right-of-way, Contractor shall ensure that roadways and sidewalks, adjacent to and in the vicinity of the

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construction site, are kept in a clean, orderly and unobstructed condition for safe use and access to nearby properties by the general public.

SC-7.03 - Add the following new paragraph immediately after Paragraph 7.03.C:

- D. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.05.A - Add the following language to Paragraph 7.05.A:

Request for Engineer's clarification of materials and equipment considered "or-equal" prior to the Effective Date of the Agreement must be received by the Engineer at least 15 days prior to the date for receipt of Bids. No item of material or equipment will be considered by Engineer as "or equal" unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of paragraph 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed "or equal" item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

SC-7.07.A - Add the following to the end of Paragraph 7.07.A:

The total amount of work subcontracted by the Contractor shall not exceed fifty percent of the Contract price without prior approval from the Owner.

SC-7.10 - Add a new paragraph immediately after Paragraph 7.10.A:

- B. Contractor and his Subcontractors shall maintain accurate records of payment of N.C. state sales tax on materials, supplies, fixtures, and equipment, which become a part of the work. Contractor shall submit with the application for payment a certified statement showing sales tax paid by Contractor and Subcontractors. Certified statement shall list suppliers' invoices showing invoice number, amount paid, tax paid, date and county paid. Sales tax records and certified statements shall be in such form and substance as to meet the requirements of the N.C. State Department of Revenue in the matter of the Owner obtaining a refund from the State of North Carolina of sales taxes paid by Contractor and his Subcontractors. The Owner's Sales Tax form is included in the Contract Documents.

SC-7.12.A - Amend paragraph by adding the following after "written interpretations and clarifications,":

Manufacturers' Certifications,

SC-7.12.A - Add the following to the end of Paragraph 7.12.A:

Refer to submittals for detailed requirements concerning record documents.

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SC-7 - Add the following new section after Paragraph 7.19.G:

- 7.20 *E-Verify and Iran Divestment*
- A. In accordance with North Carolina General Statute 143-133.3, Contractor and Contractor's subcontractors shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes (i.e. Contractors and subcontractors must use E-Verify).
 - B. By submitting a bid and executing the Agreement with the OWNER, CONTRACTOR shall be certifying that the CONTRACTOR is not listed on the Final Divestment List created by the State Treasurer pursuant to North Carolina Session Law 2015-118 and Chapter 147, Article 6E of the North Carolina General Statutes. Any agreement between CONTRACTOR and OWNER shall not be assignable to any entity on the Final Divestment List.

ARTICLE 8—OTHER WORK AT THE SITE

SC-8.01.A - Add the following to paragraph 8.01.A:

Refer to the Section 01010 Project Requirements for work at the site by Contractors, Owner, and others.

SC-8.02 - Add the following new Paragraph 8.02.C immediately after Paragraph 8.02.B:

- C. Owner intends to contract with others for the performance of other work at or adjacent to the Site.
 - 1. The General Contractor shall have authority and responsibility for coordination of the various contractors and work forces at the Site;
 - 2. The following specific matters are to be covered by such authority and responsibility: scheduling delivery of materials, storage of materials, sequencing of construction involving different trades, resolving interface issues between trades, scheduling testing, etc.
 - 3. The extent of such authority and responsibilities is: full authority for all aspects that do not impact the design or function of the Work.
 - 4. Ballfield lighting systems, structures and equipment will be purchased by Currituck County and installed by Musco Sports Lighting, LLC. Contractor shall provide electrical services, connections, etc. As shown on the plans and in the Contract Documents.

ARTICLE 9—OWNER’S RESPONSIBILITIES

No suggested supplementary conditions in this article.

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

SC-10.03.A - Add the following new subparagraph immediately after Paragraph 10.03.A:

1. On this Project, by agreement with the Owner, the Engineer will not furnish a Resident Project Representative to represent Engineer at the Site or assist Engineer in observing the progress and quality of the Work.

ARTICLE 11—CHANGES TO THE CONTRACT

No suggested Supplementary Conditions in this Article.

ARTICLE 12—CLAIMS

No suggested Supplementary Conditions in this Article.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

SC-13.01.B.5.c.(2) - Supplement Paragraph 13.01.B.5.c.(2) by adding the following sentence:

The equipment rental rate book that governs the included costs for the rental of machinery and equipment owned by Contractor (or a related entity) under the Cost of the Work provisions of this Contract is the most current edition of Rental Rate Blue Book for Construction Equipment.

SC-13.01.C.2 - Supplement Paragraph 13.01.C.2 by adding the following definition of small tools and hand tools:

For purposes of this paragraph, “small tools and hand tools” means any tool or equipment whose current price if it were purchased new at retail would be less than \$500.

SC-13.02.B – Delete Paragraph 13.02.B in its entirety and insert the following in its place:

Unit Price Additional Allowances: Contractor agrees that:

1. the allowances are to be used as an adjustment in the event the work requires additional items described.
2. Unit prices shall include all fees, taxes, profit, bond, overhead and similar items as specified in The Project Manual documents and specifications.
3. Unit prices are per 13.03 of the General Conditions.
4. charge to the UP Allowances must be approved in written memo by the Engineer.
5. unused allowance prices will addressed per 13.02.D of the General Conditions.

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SC-13.03.E - Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the extended price of a particular item of Unit Price Work amounts to 10 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

No suggested Supplementary Conditions in this Article.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

SC-15.01.B.2 – Add the following language at the end of Paragraph 15.01.B.2:

Payment for stored materials and equipment will only be made for major items of materials or equipment. Payment for such materials and equipment shall be based only upon the actual cost of the materials and equipment to Contractor and shall not include any overhead or profit to Contractor. The Contractor shall include a cumulative monthly summary of all materials stored on site in accordance with the form shown in EJCDC C-620. As materials are entered into construction, the last column will be reduced correspondingly. The total of the last column will be paid as materials stored on site, less retainage.

The Contractor shall provide sales tax reports in the form required by the Owner (included in the Contract Documents) with each Application for Payment.

The Contractor shall note the requirements for record drawings with each application for payment listed in the Specification section entitled SUBMITTALS.

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SC-15.01.B.4 – Add the following language at the end of paragraph:

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage or invest the retainage for the benefit of the Contractor.

SC-15.01.B – Add new paragraph immediately after Paragraph 15.01.B.4:

5. The Application for Payment form to be used on this Project is EJCDC® C-620, as included in the project documents.

SC-15.01.D.1 – Amend paragraph by replacing “Ten” with “Twenty-five”.

SC-15.02.A – Amend paragraph by striking out the following text: “7 days after”.

SC-15.03 - Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

SC-15.04.A Add the following new Paragraph 5 after 15.04.A.4:

5. Such taking possession or use will not be deemed an acceptance of any work not completed in accordance with the Contract Documents. Owner's use of any facilities so identified in the Contract Documents will not be grounds for extension of the contract time or change in the contract price. Owner's use of any facilities not specifically identified in the Contract Documents will be in accordance with conditions agreed to prior to such use, and any extra costs or delays in completion incurred and properly claimed by Contractor will be equitably adjusted with a change order.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No suggested Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

No suggested Supplementary Conditions in this Article.

ARTICLE 18—MISCELLANEOUS

No suggested Supplementary Conditions in this Article.

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EXHIBIT A—FORESEEABLE BAD WEATHER DAYS

Month	Number of Foreseeable Bad Weather Days in Month Based on Precipitation as Rain Equivalent (inches) (1)	Ambient Outdoor Air Temperature (degrees F)	
		Number of Foreseeable Bad Weather Days in Month Based on Low Temperature (at 11:00 a.m.)	Number of Foreseeable Bad Weather Days in Month Based on High Temperature (at 3:00 p.m.)
January	7	NA	NA
February	7	NA	NA
March	7	NA	NA
April	6	NA	NA
May	7	NA	NA
June	7	NA	NA
July	8	NA	NA
August	7	NA	NA
September	6	NA	NA
October	5	NA	NA
November	5	NA	NA
December	6	NA	NA
Notes:			
1. Two inches of sleet equal one inch of rain. Five inches of wet, heavy snow equal one inch of rain. Fifteen inches of “dry” powder snow equals one inch of rain.			

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**E-VERIFY CERTIFICATION
PURSUANT TO NORTH CAROLINA GENERAL STATUTE 143-133.3**

Name of Contractor:

Pursuant to North Carolina General Statute 153A-449, no county may enter into a contract unless the contractor and the contractor's subcontractors comply with the E-verify requirements of Article 2 of Chapter 64 of the North Carolina General Statutes.

In accordance with North Carolina General Statute 143-133.3, the undersigned hereby certifies, and incorporates into its contract with Pitt County, that the Contractor names herein, and the Contractor's subcontractors, comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes.

The undersigned hereby certifies that he or she is authorized by the Contractor named above to make the foregoing certification.

Signature

Date

Printed Name

Title

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**IRAN DIVESTMENT ACT CERTIFICATION REQUIRED BY
NORTH CAROLINA SESSION LAW 2015-118 AND
CHAPTER 147, ARTICLE 6E OF THE NORTH CAROLINA GENERAL STATUTES**

Name of Contractor: _____

As of the date listed below, the Contractor named above is not listed on the Final Divestment List created by the State Treasurer pursuant to North Carolina Session Law 2015-118 and Chapter 147, Article 6E of the North Carolina General Statutes.

The undersigned hereby certifies that he or she is authorized by the Contractor named above to make the foregoing statement.

Signature

Date

Printed Name

Title

Notes to persons signing this form:

North Carolina Session Law 2015-118 and Chapter 147, Article 6E of the North Carolina General Statutes requires this certification for bids or contracts with the State of North Carolina, a North Carolina local government, or any other political subdivision of the State of North Carolina. The certification is required at the following times:

- When a bid is submitted
- When a contract is entered into (if the certification was not already made when the vendor made its bid)
- When a contract is renewed or assigned

North Carolina Session Law 2015-118 and Chapter 147, Article 6E of the North Carolina General Statutes also requires that contractors with the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any subcontractor found on the State Treasurer's Final Divestment List.

The State Treasurer's Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurer.com/Iran and will be updated every 180 days.

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WORK CHANGE DIRECTIVE NO.:

Owner: _____ Owner's Project No.: _____
Engineer: _____ Engineer's Project No.: _____
Contractor: _____ Contractor's Project No.: _____
Project: _____
Contract Name: _____
Date Issued: _____ Effective Date of Work Change Directive: _____

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments:

Purpose for the Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Notes to User—Check one or both of the following

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: \$ _____ [increase] [decrease] [not yet estimated].

Contract Time: _____ days [increase] [decrease] [not yet estimated].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

Recommended by Engineer

Authorized by Owner

By:

Title:

Date:

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CHANGE ORDER NO.:

Owner: _____ Owner's Project No.: _____
 Engineer: _____ Engineer's Project No.: _____
 Contractor: _____ Contractor's Project No.: _____
 Project: _____
 Contract Name: _____

Effective Date of Change Order:
 Date Issued: _____

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments:

Change in Contract Price		Change in Contract Times	
Original Contract Price:		Original Contract Times:	
\$ _____		Substantial Completion: _____	
		Ready for final payment: _____	
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. [Number of previous Change Order] :		[Increase] [Decrease] from previously approved Change Orders No.1 to No. [Number of previous Change Order] :	
\$ _____		Substantial Completion: _____	
		Ready for final payment: _____	
Contract Price prior to this Change Order:		Contract Times prior to this Change Order:	
\$ _____		Substantial Completion: _____	
		Ready for final payment: _____	
[Increase] [Decrease] this Change Order:		[Increase] [Decrease] this Change Order:	
\$ _____		Substantial Completion: _____	
		Ready for final payment: _____	
Contract Price incorporating this Change Order:		Contract Times with all approved Change Orders:	
\$ _____		Substantial Completion: _____	
		Ready for final payment: _____	

Recommended by Engineer (if required) By: _____ Title: _____ Date: _____	Accepted by Contractor _____ _____ _____

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	<u>Authorized by Owner</u>	<u>Approved by Funding Agency (if applicable)</u>
By:	<u></u>	<u></u>
Title:	<u></u>	<u></u>
Date:	<u></u>	<u></u>

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FIELD ORDER NO.:

Owner:

Engineer:

Contractor:

Project:

Contract Name:

Date Issued:

Owner's Project No.:

Engineer's Project No.:

Contractor's Project No.:

Effective Date of Field Order:

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

Attachments:

Issued by Engineer

By: _____

Title: _____

Date: _____

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NOTICE OF ACCEPTABILITY OF WORK

Owner: _____ Owner's Project No.: _____
Engineer: _____ Engineer's Project No.: _____
Contractor: _____ Contractor's Project No.: _____
Project: _____
Contract Name: _____
Notice Date: _____ Effective Date of the Construction Contract: _____

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated **[date of professional services agreement]** ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner/Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner/Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By (signature): _____

Name (printed): _____

Title: _____

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SECTION 01010 - PROJECT REQUIREMENTS

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

- **STATEMENT OF SPECIAL INSPECTIONS for STRUCTURAL for Currituck County, Pages 1-29, attached at the end of this section shall be coordinated with the STRUCTURAL ENGINEER: Pages 1-5, 7-8, 10, 13, 24 of 29 for a total excerpt of 10 pages.**

GENERAL DESCRIPTION OF WORK:

The Work to be performed under these Contract Documents consists of the construction of

Currituck Community Park Phase III – Baseball/Softball Fields

The Project consists of the construction of two (2) baseball/softball fields and associated parking lots, facilities, services, and amenities, located at

181 Maple Parkway, Barco, North Carolina

The Work is divided into Contracts as follows:

CONTRACT I - General Contract for Construction – Refer to Drawings Cover Sheet for List of Applicable Construction Drawings.

CONTRACT II – Musco Co. High Ballfield Lighting Package

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OTHER CONSTRUCTION CONTRACTS:

Work at the site performed by others under separate contracts includes the following:

Musco Co. High-Up Ballfield Lighting Package.

COORDINATION:

CONTRACTOR under each Contract of the project shall plan, schedule, and coordinate his operations in a manner which will facilitate the simultaneous progress of the Work under other Contracts of this project and Work included under other contracts outside the scope of these Contract Documents.

Contract I – General Contract for Construction -- shall be the project expeditor and shall be responsible for planning, scheduling and coordinating the operations of the other contracts in a manner which will facilitate the simultaneous progress of the Work under each contract of this project and Work under other contracts outside the scope of these Contract Documents.

RESPONSIBILITY FOR MATERIALS AND EQUIPMENT:

Items Furnished by CONTRACTOR: CONTRACTOR shall be fully responsible for all materials and equipment which he has furnished, and shall furnish necessary replacements at any time prior to expiration of the Guaranty Period.

OFF SITE STORAGE:

Off-site storage arrangements shall be acceptable to OWNER for all materials and equipment not incorporated into the work but included in Applications for Payment. Such off-site storage arrangements shall be presented in writing, and shall afford adequate and satisfactory security and protection. Off-site storage facilities shall be accessible to ENGINEER.

EQUIVALENT MATERIALS AND EQUIPMENT:

It is the intent of the specifications to ensure that materials and equipment of the highest reliability are supplied. The design of the overall product and selection of materials and equipment included in these specifications have been based upon dimensions, structures, connection wiring, etc.

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required for the first manufacturer listed in every reference to a quality standard. If material or equipment of another manufacturer (including alternatives specifically referenced) is offered, the cost of any changes in structures, building, piping, wiring, etc., as well as any detailed drawings necessary to show such required changes, shall be borne by the CONTRACTOR with no additional cost to the Owner.

PREPARATION FOR SHIPMENT:

All materials shall be suitably packaged to facilitate handling and protection against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of ENGINEER.

Each item, package or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

SALVAGE OF MATERIALS AND EQUIPMENT:

Existing materials and equipment removed, and not reused, as a part of the Work shall become CONTRACTOR's property except the following items which shall remain OWNER's property:
none known

Salvaged items not to be reused in the Work, but to remain OWNER's property, shall be delivered by CONTRACTOR in good condition to OWNER at TBD.

CONTRACTOR shall carefully remove in a manner to prevent damage all materials and equipment specified or indicated to be salvaged and reused or to remain property of OWNER. He shall store and protect salvaged items specified or indicated to be reused in the Work.

Any items damaged in removal, storage or handling through carelessness or improper procedures shall be replaced by CONTRACTOR in kind or with new items.

CONTRACTOR may at his option furnish and install new items in lieu of those specified or indicated to be salvaged and reused, in which case such removed items will become CONTRACTOR's property.

Existing materials and equipment removed by CONTRACTOR shall not be reused in the Work except where so specified or indicated.

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LAND FOR CONSTRUCTION PURPOSES:

CONTRACTOR will be permitted to use available land belonging to OWNER, on or near the site of the Work, for construction purposes and for the storage of materials and equipment. The location and extent of the areas so used shall be as indicated on the drawings or will be as follows:

CONTRACTOR shall immediately move stored material or equipment if any occasion arises, as determined by OWNER, requiring access to the storage area. Materials or equipment shall not be placed on the property of OWNER until OWNER has agreed to the location to be used for storage.

EASEMENTS AND RIGHTS-OF-WAY:

The easements and rights-of-way for the pipelines will be provided by OWNER. CONTRACTOR shall confine his construction operations within the limits indicated on the drawings, and shall use due care in placing construction tools, equipment, excavated materials and pipeline materials and supplies, so as to cause the least possible damage to property and interference with traffic.

On Private Property: Easements across private property are indicated on the drawings. CONTRACTOR shall set stakes to mark the boundaries of construction easement across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

On Private Property: Temporary construction easements across private property are feet wide. The permanent easements are ____ feet wide, except where special conditions exist. CONTRACTOR shall set stakes to mark the boundaries of construction easement across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

CONTRACTOR shall not enter for pipe delivery or occupy for any other purpose with men, tools, equipment, construction materials or with materials excavated from the pipe trench, any private property outside the designated construction easement boundaries without written permission from the owner and tenant of the property.

Whenever the easement is occupied by crops which will be damaged by construction operations, CONTRACTOR shall notify the owner and tenant sufficiently in advance so that the crops may be removed before excavation or trenching is started. CONTRACTOR shall be responsible for all damage to crops outside of the easement, and shall make satisfactory settlement for the damage directly with the property owner and tenant involved.

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Where the line crosses fields which are leveled for irrigation or terraced, CONTRACTOR shall relevel irrigated fields and replace all terraces to their original or better condition, and to the satisfaction of the property owner and tenant involved.

Work Within Highway and Railroad Rights-of-Way: Permits shall be obtained by OWNER. All Work performed and all operations of CONTRACTOR, his employees or subcontractors, within the limits of railroad and highway rights-of-way, shall be in conformity with the requirements and be under the control (through OWNER) of the railroad or highway authority owning, or having jurisdiction over and control of, the right-of-way in each case.

Bond: NCDOT will require the CONTRACTOR to post a performance bond on this project of see DOT permits in Specification Appendix.

Performance and Indemnity Bond: The CONTRACTOR shall provide a Performance and Indemnity Bond (D.O.T. form R/W 16A) in the amount of \$10,000 or a Continuing Indemnity Bond (D.O.T. form R/W 16B) as required by the North Carolina Department of Transportation. The cost of the bond shall be included in the unit price bid for the work.

OPERATION OF EXISTING FACILITIES:

The existing water/sewer/road services must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from OWNER in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

CONTRACTOR shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

NOTICES TO OWNERS AND AUTHORITIES:

CONTRACTOR shall, as provided in General Conditions, notify owners of adjacent property and utilities when prosecution of the Work may affect them.

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When it is necessary to temporarily deny access by owners or tenants to their property, or when any utility service connection must be interrupted, CONTRACTOR shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit their inconvenience.

Utilities and other concerned agencies shall be contacted at least 72 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

CONTRACTOR shall contact 811 72 hours prior to any excavation. Locations of existing utilities by 811 are good for only ten (10) days after the date of location.

LINES AND GRADES:

All Work shall be done to the lines, grades, and elevations shown on the drawings.

Basic horizontal and vertical control points have been or will be established or designated by ENGINEER on the Drawings. These points shall be used as datum for the Work. All additional field survey, layout and measurement Work shall be performed by CONTRACTOR as a part of the Work.

CONTRACTOR shall provide an experienced surveyor, instrument man, competent assistants and such instruments, tools, stakes and other materials required to complete the survey, layout and measurement Work. In addition, CONTRACTOR shall furnish, without charge, competent surveyors from his force and such tools, stakes and other materials as ENGINEER may require in establishing or designating control points, in establishing construction easement boundaries or in checking survey, layout and measurement Work performed by CONTRACTOR.

CONTRACTOR shall keep ENGINEER informed, a reasonable time in advance, of the times and places at which he wishes to do Work, so that any checking deemed necessary by ENGINEER may be done with minimum inconvenience to ENGINEER and minimum delay to CONTRACTOR.

CONTRACTOR shall remove and reconstruct Work which is improperly located.

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OMIT THE FOLLOWING IF SEPARATE SECTION 01020 ALLOWANCES IS USED.

ALLOWANCES:

The Contract Price includes cash allowances for certain materials, equipment and portions of the Work as follows:

(TBD--Allowances are shown in the Bid Form.)

OWNER, in consultation with ENGINEER, shall select from supplies, samples, information or alternatives submitted by CONTRACTOR. Testing agency shall be selected by and work for the OWNER, but be paid by the CONTRACTOR out of the above allowance.

CONTRACTOR shall cause the Work to be done by materialmen, suppliers or Subcontractors and for amounts satisfactory to ENGINEER. The Contract Price will be adjusted by Change Order for any difference between CONTRACTOR's direct cost for the selected alternative and the cash allowance included in such price adjustments. The cost shall be the actual invoice cost including tax and shipping of items covered by the allowance. The CONTRACTOR shall include any costs for labor overhead and profit in other portions of his bid.

CONNECTIONS TO EXISTING FACILITIES:

Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities including structures, drain lines and utilities such as water, sewer, gas, telephone and electric. In each case, CONTRACTOR shall receive permission from OWNER or the owning utility prior to undertaking connections. CONTRACTOR shall protect facilities against deleterious substances and damage.

Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

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UNFAVORABLE CONSTRUCTION CONDITIONS:

During unfavorable weather, wet ground or other unsuitable construction conditions, the CONTRACTOR shall confine his operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by CONTRACTOR to perform the Work in a proper and satisfactory manner.

CUTTING AND PATCHING:

As provided in General Conditions, CONTRACTOR shall perform all cutting and patching required for the Work, and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

CONTRACTOR shall perform all cutting and patching required for the installation of improperly timed Work, to remove samples of installed materials for testing and to provide for alteration of existing facilities or the installation of new Work in existing construction.

Except when the cutting or removal of existing construction is specified or indicated, CONTRACTOR shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without ENGINEER's concurrence.

CONTRACTOR shall provide all shoring, bracing, supports and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations.

Materials shall be cut and removed to the extent indicated on the drawings or as required to complete the Work. Materials shall be removed in a careful manner with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by CONTRACTOR.

All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to ENGINEER, to obtain a finished installation with the strength, appearance and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

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CLEANING UP:

CONTRACTOR shall keep the premises free at all times from accumulations of waste materials and rubbish. CONTRACTOR shall provide adequate trash receptacles about the site, and shall promptly empty the containers when filled.

Construction materials stored on the site shall be kept off the ground, neatly stacked, protected from rain and sun when required by the ENGINEER, and the area around the stored materials shall be kept free of trash, weeds and brush.

Construction materials, such as concrete forms and scaffolding shall be neatly stacked by CONTRACTOR when not in use. CONTRACTOR shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids and cleaning solutions from surfaces to prevent marring or other damage.

Volatile wastes shall be properly stored in covered metal containers and removed daily.

Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and antipollution laws.

Adequate cleanup shall be a condition for recommendation of progress payment applications.

APPLICABLE CODES:

References in the Contract Documents to local codes mean the North Carolina State Building Code and any applicable County or municipal codes.

Other standard codes which apply to the Work are designated in the specifications.

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REFERENCE STANDARDS:

Reference to the standards of any technical society, organization or association, or to codes of local or state authorities, shall mean the latest standard, code, specification or tentative standard adopted and published at the date of receipt of bids, unless specifically stated otherwise.

ABBREVIATIONS AND SYMBOLS:

Abbreviations used in the Contract Documents are defined as follows:

AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineer
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWPA	American Wood Products Association
AWS	American Welding Society
AWWA	American Water Works Association
CGA	Compressed Gas Association, Inc.
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
DEQ	Department of Environmental Quality
DHI	Door and Hardware Institute

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Fed Spec	Federal Specifications
FGMA	Flat Glass Marketing Association
IBBM	Iron Body, Bronze Mounted
IEEE	Institute Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
IPS	Iron Pipe Size
MIL	Military Specification
NAAMM	National Association of Architectural Metals Manufacturers
NCDOT	North Carolina Department of Transportation
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Thread
NSPC	National Standard Plumbing Code
OSHA	Occupational Safety and Health Administration
PCI	Prestressed Concrete Institute
PS	Product Standard
SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Society of the Plastics Industry
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratories
US	U. S. Bureau of Standards
USBR	U. S. Bureau of Reclamation

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ALTERNATIVES:

The Work required under the base Bid is indicated in the specifications and on the drawings. All requirements specified or indicated also apply to each alternative selected by OWNER except as otherwise provided. The following alternatives are provided for on the Bid Form.

Alternative A:

Related work affected by Alternative A will be:

Alternative B:

Related work affected by Alternative B will be:

The manner in which various portions of the Work must be changed to accommodate each alternative and its related Work is also indicated on the drawings.

SPECIFIER. EDITING OF THE FOLLOWING PARAGRAPH WILL OFTEN BE APPROPRIATE.

PRECONSTRUCTION CONFERENCE:

Prior to the commencement of Work at the site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by:

CONTRACTOR and his superintendent

Principal Subcontractors

Representatives of principal suppliers and manufacturers as appropriate

ENGINEER and his Resident Project Representative

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Representatives of OWNER

Governmental representatives as appropriate

Others as requested by CONTRACTOR, OWNER, or ENGINEER

Unless previously submitted to ENGINEER, CONTRACTOR shall bring to the conference a tentative schedule for each of the following:

Progress

Procurement

Values for progress payment purposes

Shop Drawings and other submittals

The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

CONTRACTOR's tentative construction schedules

Transmittal, review, and distribution of CONTRACTOR's submittals

Processing applications for payment

Maintaining record documents

Critical Work sequencing

Processing of Field Orders, Work Change Directives, and Change Orders

Use of premises, office and storage areas, security, housekeeping, working hours, and OWNER's needs

Major equipment deliveries and priorities

CONTRACTOR'S assignments for safety and first aid

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ENGINEER will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

PROGRESS MEETINGS:

CONTRACTORS shall attend regular progress meetings at least monthly and at other times as requested by ENGINEER or required by progress of the Work.

CONTRACTOR, ENGINEER, OWNER, and all subcontractors active on the site shall be represented at each meeting. CONTRACTORS may at their discretion request attendance by representatives of their suppliers, manufacturers and other subcontractors. Representatives at the progress meeting must be authorized to make decisions and to act on behalf of the organization they represent.

ENGINEER shall preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling and resolve other problems which may develop.

The CONTRACTOR shall generate documentation to list and/or illustrate work/tasks begun or completed since the previous progress meeting, and work/tasks expected to begin or be completed in the next 30 days following the current progress meeting. Preliminary or draft versions of this documentation should be circulated among critical subcontractors, the ENGINEER, and the OWNER, at least two (2) days prior to the scheduled progress meeting, such that schedule conflicts and other scheduling issues can be discussed during the progress meeting. CONTRACTOR shall provide sufficient copies of the documentation for distribution at the progress meeting.

OTHER MEETINGS AND CONFERENCES:

The OWNER and ENGINEER reserve the right to conduct other site meetings and conferences as necessary to monitor and facilitate the quality of the work and operation of the existing facility. Specific meetings and conferences have been outlined in individual specification sections. Other meetings and/or conferences may include, but not be limited to, pre-installation and pre-startup. These meetings and/or conferences shall be attended by the CONTRACTOR, the ENGINEER, the OWNER, critical subcontractors, regulatory officials (if necessary), and representatives of manufacturers and suppliers as deemed necessary.

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SITE ADMINISTRATION:

The General Contractor shall be responsible for all areas of the site used by him, by other contractors, and all subcontractors in the performance of the Work. He will exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to OWNER or others. CONTRACTOR has the right to exclude from the site all persons who have no purpose related to the Work or its inspection, and may require all persons on the site (except OWNER's employees and ENGINEER) to observe the same regulations as he requires of his employees.

END OF SECTION 01010

Statement of Special Inspections

Project: Currituck Community Park Phase III

Location: Barco, Currituck County, NC

Owner's Representative:

Owner's Address: Currituck Community Park, Shortcut Rd., Barco, NC 27971

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	Kevin M. Roomsburg, PE	6/25/2025
	(Type or print name) (Signature)	(Date)
Architectural	Dani Hoff, AIA	6/25/2025
	(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 Currituck County 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.

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 Currituck County 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)	Gerald Stalls, Jr., P.E. Terracon	106 Capital Trace, Unit E Elizabeth City, NC 27909 (252) 335-9765 Jerry.Stalls@terracon.com
5. Other (O-1)		

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

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

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

Wind Exposure Category: ☐ B ☒ C ☐ D

Schedule of Special Inspection Services

Structural Steel and High-Strength Bolting

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			AISC 360	NCBC	
1. Fabricator Certification / Verification of Quality Control Procedures					1
a. Verify fabricator qualifications	☒	C		1704.2.5.1	1
b. Review material test reports & certifications	☒	C	N5.2		1
c. Collect certificates of compliance from the steel fabricator at completion of fabrication	☒	C		1704.5	1
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		1
b. Fasteners are marked per ASTM requirements	☒	P	Tbl N5.6-1		2
c. Ensure correct fasteners and bolting procedures are selected for joint details	☒	P	Tbl N5.6-1		2
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		2
e. Observe and document pre-installation verification testing by installation personnel for fastener assemblies and methods	☒	P	Tbl N5.6-1		2
f. Verify proper storage provided for all fastener components	☒	P	Tbl N5.6-1		2
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		1
b. Inspection of fabricated assemblies & erected steel framing verifying compliance with the construction documents	☒	P	N5.7		1
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		1
b. Confirm weld material type & grade	☒	P	Tbl N5.4-1		2
c. Confirm method of welder identification	☒	P	Tbl N5.4-1		2
d. Inspection of fit-up for groove & fillet welds including access hole configuration & finish	☒	P	Tbl N5.4-1		2
2. Inspections During Welding			N5.4		
a. Verify welder qualifications	☒	P	Tbl N5.4-2		2
b. Verify proper control and handling of welding consumables	☒	P	Tbl N5.4-2		2
c. Monitor environmental conditions	☒	P	Tbl N5.4-2		2
d. Monitor proper implementation of WPS	☒	P	Tbl N5.4-2		2
e. Inspection of welding techniques including no welding over cracked tack welds	☒	P	Tbl N5.4-2		2
3. Inspections After Welding			N5.4, N5.5		
a. Verify welds have been cleaned	☒	O	Tbl N5.4-3		2
b. Confirm the installed size, length and location of welds matches the contract documents	☒	P	Tbl N5.4-3		2
c. Verify welds meet visual acceptance criteria	☒	P	Tbl N5.4-3		2
d. Confirm arc strikes comply with Part 5.28 of AWS D1.1	☒	P	Tbl N5.4-3		2
e. Visually observe web k-area for cracks within 3" of welded doubler plates, continuity plates and stiffeners	☐	P	Tbl N5.4-3		
f. Backing and weld tabs removed per contract documents	☐	P	Tbl N5.4-3		
g. Observe and inspect weld repair activities	☒	P	Tbl N5.4-3		2
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		
l. Document acceptance / rejection of welded joints and members	☒	P	Tbl N5.4-3, N5.5g		2

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

Schedule of Special Inspection Services
Cold-Formed Steel Framing

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard	NCBC	
1. Fabricator Certification / Verification of Quality Control Procedures					
a. Verify fabricator qualifications	☒	P		1704.2.5.1	1
b. Collect certificates of compliance from the steel fabricator at completion of fabrication	☒	P		1704.5	1
2. For trusses clear spanning 60 feet or more, verify that both temporary and permanent restraints and braces are installed in accordance with the approved truss submittal package.	☐	P		1705.2.4	

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	1
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		1
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	1
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	2
6. Inspect concrete and shotcrete placement for proper application techniques	☒	C	ACI 26.5	1908.6, 1908.7, 1908.8	2
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	1/2
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

Masonry – Level B

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

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

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

Schedule of Special Inspection Services
Soils

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agents
			Standard	NCBC	
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity	☒	P		1705.6	2
2. Verify excavations extend to proper depth and have reached the correct soil material	☒	P		1705.6	2
3. Perform classification and testing of compacted fill materials	☒	P		1705.6	2
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	2
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	2

Schedule of Special Inspection Services
Special Inspections for Wind Resistance

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard	NCBC	
1. Prior to any work taking place, each contractor responsible for the construction of a wind-resisting system or component shall submit a written statement of contractor responsibility	☒	C		1704.4	1
2. Structural Wood					
a. Verify field gluing operations pertinent to the main wind force-resisting system	☐	C		1705.11.1	
b. Inspect nailing, anchoring, and fastening of components within the main windforce-resisting system including shear walls, diaphragms, drag struts, braces & hold-downs	☐	P		1705.11.1	
3. Cold-Formed Steel Light Frame Construction					
a. Inspect welding operations at elements of the main windforce-resisting system	☐	P		1705.11.2	
b. Inspect screw attachment, bolting, anchoring, and fastening of elements within the main windforce-resisting system including shear walls, braces, diaphragms collectors, drag struts and hold-downs	☐	P		1705.11.2	
4. Wind-resisting components					
a. Inspect the fastening of roof covering, roof deck and supporting roof framing connections	☒	P		1705.11.3.1	1/2
b. Inspect the fastening of exterior wall coverings & the wall connections to the roof / floor diaphragms & framing members	☒	P		1705.11.3.2	1/2

Structural Wood and Cold-Formed Steel Light-Frame Construction Main Wind-Force Resisting System(s) Subject to Special Inspections:

Roof Cladding Components and Connections Subject to Special Inspections:

Wall Cladding Components and Connections Subject to Special Inspections:

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SECTION 01320 - EQUIPMENT SCHEDULE

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

SCOPE:

This section consists of a schedule of the items of equipment for which manufacturer's field services, operation and maintenance manuals, or the manufacturer's or supplier's certificate of compliance are required.

Specific requirements for manufacturer's field services are covered in the quality control section.

Specific requirements for operation and maintenance manuals and certificates of compliance are covered in the submittals section.

SCHEDULE

Manufacturer's field services, operation and maintenance manuals, and certificates of compliance shall be provided for the items of equipment indicated in the following schedule.

<u>SPECIFICATION SECTION</u>	<u>TYPE OF EQUIPMENT</u>	<u>MFGR'S FIELD SERVICES</u>	<u>O&M MANUAL</u>	<u>CERTIFICATE OF COMPLIANCE</u>

{To Be Determined per Owner's Facility Maintenance}

END OF SECTION 01320

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SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

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1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
 - e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

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2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
 - 2. Stagger splices in accordance with ACI 318 (ACI 318M).
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches (305 mm).
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

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4. Lace overlaps with wire.

3.3 JOINTS

- A. 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.
 2. Continue reinforcement across construction joints unless otherwise indicated.
 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117 (ACI 117M).

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 1. Steel-reinforcement placement.
- D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION 03 20 00

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SECTION 033000 – CAST-IN-PLACE CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.

1.2 DEFINITIONS

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

- ###### B. Water/Cement Ratio (w/cm):
- The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
2. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Semirigid joint fillers.
 - d. Vapor-retarder installation.
 - e. Anchor rod and anchorage device installation tolerances.
 - f. Cold and hot weather concreting procedures.
 - g. Concrete finishes and finishing.

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- h. Curing procedures.
- i. Forms and form-removal limitations.
- j. Concrete protection.
- k. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- l. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

- 1. Portland cement.
- 2. Fly ash.
- 3. Slag cement.
- 4. Blended hydraulic cement.
- 5. Silica fume.
- 6. Performance-based hydraulic cement
- 7. Aggregates.
- 8. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
- 9. Vapor retarders.
- 10. Floor and slab treatments.
- 11. Liquid floor treatments.
- 12. Curing materials.
 - a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
- 13. Joint fillers.
- 14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

- 1. Mixture identification.
- 2. Minimum 28-day compressive strength.
- 3. Durability exposure class.
- 4. Maximum w/cm.
- 5. Calculated equilibrium unit weight, for lightweight concrete.
- 6. Slump limit.
- 7. Air content.
- 8. Nominal maximum aggregate size.
- 9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
- 10. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
- 11. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.

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12. Intended placement method.
 13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
 2. Location within Project.
 3. Exposure Class designation.
 4. Formed Surface Finish designation and final finish.
 5. Curing process.
 6. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.
 2. Ready-mixed concrete manufacturer.
 3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Curing compounds.
 4. Floor and slab treatments.
 5. Bonding agents.
 6. Adhesives.
 7. Vapor retarders.
 8. Semirigid joint filler.
 9. Joint-filler strips.
 10. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
1. Portland cement.
 2. Fly ash.
 3. Slag cement.
 4. Blended hydraulic cement.
 5. Silica fume.
 6. Performance-based hydraulic cement.
 7. Aggregates.
 8. Admixtures:
 - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

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- D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.
- E. Research Reports:
 - 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
 - 2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.
- F. Preconstruction Test Reports: For each mix design.
- G. Field quality-control reports.
- H. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

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1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

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B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I Type II Type I/II.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Silica Fume: ASTM C1240 amorphous silica.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301 (ACI 301M).
2. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
7. 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 C494/C494M, Type C.
8. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

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9. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).
 - a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRD C48 at a hydraulic pressure of 200 psi (1.28 MPa) for 14 days.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

- a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- D. Curing Paper: 8-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
 - E. Water: Potable or complying with ASTM C1602/C1602M.
 - F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
 - G. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B.

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- H. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating.
- I. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
- J. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand, as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

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2.8 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, in accordance with ACI 301 (ACI 301M).
 - 1. Use a qualified 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 or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Silica Fume: 10 percent by mass.
 - 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 - 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with 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, and concrete with a w/cm below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
 - 5. Use permeability-reducing admixture in concrete mixtures where indicated.

2.9 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.
 - 1. Exposure Class: ACI 318 (ACI 318M) F0 S0 W0 C0 .
 - 2. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
 - 3. Maximum w/cm: 0.45 .
- B. Class C : Normal-weight concrete used for interior slabs-on-ground.
 - 1. Exposure Class: ACI 318 (ACI 318M) F0 S0 W0 C0.
 - 2. Minimum Compressive Strength: 3500 psi (24.1 MPa] at 28 days.
 - 3. Maximum w/cm: 0.45.
 - 4. Minimum Cementitious Materials Content 520 lb/cu. yd. (309 kg/cu. m)
 - 5. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

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6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Class J: Normal-weight concrete used for exterior concrete slabs and exterior retaining walls.
1. Exposure Class: ACI 318 (ACI 318M) F1 S0 W0 C1 .
 2. Minimum Compressive Strength: 4000 psi (27.6 MPa] at 28 days.
 3. Maximum w/cm: 0.45 .
 4. Air Content:
 - a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch (25-mm) nominal maximum aggregate size.
 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

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1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF 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.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
 4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

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1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) 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.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

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3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. 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.
- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.

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2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1 inch (25 mm).
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
 - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/4 inch (6 mm).
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 (ACI 117M) Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
3. ACI 301 (ACI 301M) Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/8 inch (3 mm).
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 (ACI 117M) Class A.
 - e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:
 - a. Perform no later than one day after form removal.

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- b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
 - c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
 - d. Maintain required patterns or variances as shown on Drawings.
2. Grout-Cleaned Rubbed Finish:
- a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
 - b. Do not clean concrete surfaces as Work progresses.
 - c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
 - d. Wet concrete surfaces.
 - e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.
 - f. Maintain required patterns or variances as shown on Drawings.

C. Related Unformed Surfaces:

- 1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
- 2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

- 1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
- 2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch (6 mm) in one direction.
- 3. Apply scratch finish to surfaces to receive concrete floor topping to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

- 1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
- 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.

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3. Apply float finish to surfaces to receive trowel finish and[to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraigten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. 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.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155 (ASTM E1155M), for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch (4.8 mm).

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 thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. 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 locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish to concrete stair treads, platforms, ramps as indicated on Drawings

1. Apply in accordance with manufacturer's written instructions

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

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1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. 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.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches (150 mm) high unless otherwise indicated on Drawings, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.10 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

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2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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 (300 mm), and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

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- a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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 (300 mm), and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Chemical Stain:

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- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
- 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
- 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
- 4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:

- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
- 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches (150 mm) and sealed in place.
- 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
- 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

- A. Conform to ACI 117 (ACI 117M).

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

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1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than **sevendays'** old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 4. Rinse with water; remove excess material until surface is dry.
 5. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least **one** month(s).
 2. 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 joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
1. Repair and patch defective areas when approved by Architect.
 2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) 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 (13 mm) in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch (19 mm).
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.

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- e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces:
- 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 3. After concrete has cured at least 14 days, correct high areas by grinding.
 - 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
 - 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
 - 6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 7. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete.

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- a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar.
- a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. 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.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.

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- 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. 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.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. 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.
 - b. Perform additional tests when concrete consistency appears to change.

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4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of two 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.
 - b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
 - b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
 - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. 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 (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
11. 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.
12. Additional Tests:
 - a. Testing and inspecting agency to 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.

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- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.
- 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

- 1. Protect from petroleum stains.
- 2. Diaper hydraulic equipment used over concrete surfaces.
- 3. Prohibit vehicles from interior concrete slabs.
- 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
- 5. Prohibit placement of steel items on concrete surfaces.
- 6. Prohibit use of acids or acidic detergents over concrete surfaces.
- 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

Retain subparagraph below when Project includes concrete floors scheduled to receive surface hardener of polished concrete finish.

- 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

SECTION 04 20 00 - UNIT MASONRY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Concrete masonry units.
2. Brick.
3. Mortar and grout materials.
4. Reinforcement.
5. Ties and anchors.
6. Mortar and grout mixes.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation adhered to masonry backup.

C. Related Requirements:

1. Section 014339 "Mockups" for integrated exterior mockup requirements.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 072100 "Thermal Insulation" for cavity wall insulation.

D. References

1. ASTM C270, "Standard Specification for Mortar for Unit Masonry."
2. ASTM C216, "Standard Specification for Facing Brick."
3. BIA, "Ref. 1, Cold Weather Masonry Construction and Protection Recommendations."

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.****1.3 ACTION SUBMITTALS**

- A. Product technical data sheets and color samples of mortar for review by the Owner and Engineer prior to ordering production brick. Color samples shall be physical samples utilizing the mortar product and sand type to be used on this project. Label mortar samples with product type and sand color used.
- B. Remove a section of existing damaged mortar from exterior wall joint in solid pieces to provide a color basis for new replacement mortar. Submit at the same time as and with the proposed replacement mortar. Label as existing masonry mortar.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installers: All masonry flashing installers must complete the International Masonry Institute Flashing Upgrade training course.
2. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.

C. Workmanship is of particular importance during masonry repair. Maintain consistent mortar joint sizes and clean adjacent surfaces during work.

1.5 MOCKUPS

A. Sample Panel Mockups: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 60 inches (1524 mm) long by 48 inches (1219 mm) high by full thickness.
2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of panels with masonry cleaner indicated.
5. Protect approved sample panels from the elements with weather-resistant membrane.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

- a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's original packaging with identification labels intact.

B. Store products protected from weather and at temperature and humidity conditions recommended by manufacturer.

1.7 WARRANTIES

A. Provide a Contractor's Two-Year Warranty for work included in this project. This warranty shall include workmanship, materials and weathertightness and will be provided in addition to any standard manufacturer material warranties that may be provided. The warranty will extend for a period of twenty-four (24) months from the date of Final Completion.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. CMUs: ASTM C90, normal weight.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **2000 psi at 28 days**.
 - 2. Size (Width): Manufactured to dimensions **3/8 inch (10 mm)** less than nominal dimensions.
 - 3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.2 BRICK

- A. Brick: Where possible, preserve and re-use existing brick for replacement. Brick shall meet requirements of ASTM C216. Where not possible, provide new brick to match existing brick. Provide samples of the brick to the Owner and Designer for approval of brick color and texture prior to ordering.
- B. Building (Common) Brick: ASTM C62, Grade MW.
 - 1. Size (Actual Dimensions): **3-5/8 inches (92 mm)** wide by **2-1/4 inches (57 mm)** high by **7-5/8 inches (194 mm)** long.

2.3 MORTAR AND GROUT MATERIALS

- A. Brick Mortar: Integral Water repellent mortar Portland cement mortar conforming to ASTM C270, Type N or S. Match existing mortar color at adjacent wall areas. Color match shall be determined by providing a hardened sample of the proposed mortar, mixed with all materials to be used on site. Contractor to extract a sample of existing mortar from the building for the Owner and Designer to compare to the proposed repair mortar.

2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, **Grade 60 (Grade 420)**.
- B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Exterior Walls: Stainless steel.
 - 2. Wire Size for Side Rods: **0.187-inch (4.76-mm)** diameter.
 - 3. Wire Size for Cross Rods: **0.187-inch (4.76-mm)** diameter.
 - 4. Wire Size for Veneer Ties: **0.187-inch (4.76-mm)** diameter.
 - 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than **16 inches (406 mm)** o.c.
 - 6. Provide in lengths of not less than **10 ft. (3 m)**, with prefabricated corner and tee units.
- C. Masonry-Joint Reinforcement for Multiwythe Masonry:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. 3GEN Masonry Products, Inc.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc
 - d. Wire-Bond
 - 2. Ladder type with one side rod at each face shell of hollow masonry units more than **4 inches (102 mm)**

- wide, plus [one side rod][two side rods] at each wythe of masonry 4 inches (102 mm) wide or less.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.6 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.5 EMBEDDED FLASHING

A. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Self-Adhering, Stainless Steel Fabric Flashing: Composite, flashing product consisting of 2 mil (0.05 mm) of Type 304 stainless steel sheet, bonded to a layer of polymeric fabric with a permanent, clear adhesive, to produce an overall thickness of 40 mil (1.0 mm).
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hohmann & Barnard, Inc
 - 2) STS Coatings, Inc.
 - 3) VaproShield LLC
 - 4) Wire-Bond
 - 5) York Manufacturing, Inc
 - b. Applications: Use 10-mil- (0.25-mm-) thick flashing at windows, doors, and small wall penetrations; not at base of walls. Use 40-mil- (1.0-mm-) thick flashing at base of walls.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

1. Elastomeric Sealant: ASTM C920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

D. Termination Bars for Flexible Flashing: Stainless steel bars 1/8 inch by 1 inch (3.2 mm by 25 mm).

E. Termination Bars for Flexible Flashing, Flanged: Stainless steel sheet 0.019 inch by 1-1/2 inches (0.48 mm by 38 mm) with a 3/8-inch (10-mm) flange at top.

2.6 ACCESSORIES

A. 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.

B. Masonry Cleaner: Provide a cleaner capable of removing light to moderate mold and mildew staining atmospheric staining. Product should work to remove stains with short contact time, gentle-scrubbing and a pressured water rinse. Product shall be non-acidic and not require any pre-wash or neutralization products or steps unless specifically required/recommended by the manufacturer for the type of substrate or staining present. Product must be low-odor, VOC compatible, water soluble, safe for use on occupied buildings and be non-damaging to landscaping, grass, glass, metal, and brick masonry and other finishes they may contact during cleaning.

C. Provide other accessory products (brick ties, ladder wire reinforcement, etc.) whether or not listed in the

specification or on the Project Drawings but required for the complete and proper installation of the work.

D. Weep/Cavity Vents: Use the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth **1/8 inch (3.2 mm)** less than depth of outer wythe, in color selected from manufacturer's full range.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) 3GEN Masonry Products, Inc.
 - 2) Advanced Building Products Inc.
 - 3) Heckmann Building Products, Inc.
 - 4) Hohmann & Barnard, Inc
 - 5) Mortar Net Solutions
 - 6) Wire-Bond

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Mortar Deflector: Strips, full depth of cavity and **10 inches (254 mm)** high, with dovetail-shaped notches that prevent clogging with mortar droppings.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advanced Building Products Inc.
 - 2) Hohmann & Barnard, Inc
 - 3) Keene Building Products
 - 4) Mortar Net Solutions
 - 5) Wire-Bond
 - 6) York Manufacturing, Inc

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 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other

obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of **8 inches (203 mm)**, and **1-1/2 inches (38 mm)** into the inner wythe. Form **1/4-inch (6.4-mm)** hook in edge of flashing embedded in inner wythe.
3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least **8 inches (203 mm)**; with upper edge tucked under water-resistive barrier air barrier, lapping at least **4 inches (102 mm)**. Fasten upper edge of flexible flashing to sheathing through termination bar.
4. At lintels and shelf angles, extend flashing **6 inches (152 mm)** minimum, to edge of next full unit at each end. At heads and sills, extend flashing **6 inches (152 mm)** minimum, to edge of next full unit and turn ends up not less than **2 inches (51 mm)** to form end dams.
5. Interlock end joints of sawtooth sheet metal flashing by overlapping ribs not less than **1-1/2 inches (38 mm)** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
6. Install metal drip edges and sealant stops with sawtooth sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
7. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch (13 mm)** back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.

E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes formed from plastic tubing **16 inches (406 mm)** o.c.
3. Cover cavity side of weep holes with plastic insect screening at cavities.

F. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Accessories" Article.

G. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

3.3 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. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand,

waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than **4 inches (102 mm)** in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within **18 inches (457 mm)** of finished grade.

- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

3.4 PROTECTION FOR EXISTING BUILDING

- A. Install plastic sheeting and other protection over windows and other surfaces adjacent to and/or below masonry repair work to be performed. The purpose of the protection materials is to prevent damage and possible staining of other exterior features by mortar or other materials.
- B. Install protection for surrounding landscaping, grass, and site features.

3.5 BRICK REPAIR & MASONRY JOINT REPOINTING

- A. Confirm areas of masonry repair work with Designer prior to starting repointing.
- B. Where brick can remain in place and joints need to be tuck-pointed, grind out cracked mortar joints to a depth of $\frac{3}{4}$ ". Use dust collection methods to eliminate airborne dust from grinding operations. Removal all dust and debris from joints prior to re-pointing.
- C. Spray brick and joint surfaces with water prior to re-pointing to achieve a saturated, surface-dry (SSD) condition. Install new mortar in a minimum of two lifts. Tool exposed mortar joints to match surrounding joints profiles (concave or vee).
- D. Where new brick is required, install in fresh mortar to match adjoining courses and joint profiles. Brick shall be installed in accordance with the methods and tolerances recommended by the BIA.
- E. Thoroughly mix mortar in quantities needed to conform with required proportions and for immediate use, using mechanical mortar mixer or paddle mixer. Add only clean, potable water at the project site. Do not add cement, lime, bonding agents, coloring admixtures, set accelerators, plasticizers, air entraining admixtures or other materials unless specifically authorized in writing. Use mortar within 1-1/2 hours of mixing, after which unused mortar shall be discarded. This period shall be reduced to 30 minutes in hot weather. Re-tempering shall be allowed in accordance with ASTM C270, Subparagraph 6.4, if it is demonstrated that re-tempering does not negatively affect color consistency. Re-tempering shall be used to replace water lost to evaporation only. Do not re-temper mortars which have begun to set.
- F. Tool mortar joints to match joints of the original profile. Remove excess smears from the existing adjacent surfaces.
- G. At interior walls, clean and paint areas of repaired mortar joints to match existing walls.
- H. Clean masonry following brick placement and after mortar has cured for at least seven days. Clean the completed wall surfaces to remove excess mortar, dust, and debris. Cleaning shall be performed using a pressure washer and nylon bristle brushes only.

END OF SECTION 04 20 00

SECTION 05 50 00 - METAL FABRICATIONS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Metal bollards.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
- C. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 2. Section 077200 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for mechanical and electrical equipment
 - 2. Metal bollards.
 - 3. Loose steel lintels.
- C. Samples for Verification: For each type and finish of extruded nosing and tread.
- D. Delegated Design Submittals: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer, licensed in the State of North Carolina.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Research Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless Steel Floor Plate: ASTM A793.
- G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As required for intended application.
2. Galvanized Steel: ASTM A653/A653M, structural steel, **Grade 33** (**Grade 230**), with **G90** (**Z275**) coating; **0.079-inch** (**2-mm**) nominal thickness.

- J. Aluminum Plate and Sheet: **ASTM B209** (**ASTM B209M**), Alloy 6061-T6.
- K. Aluminum Extrusions: **ASTM B221** (**ASTM B221M**), Alloy 6063-T6.
- L. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- M. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless steel fasteners for fastening aluminum.
 2. Provide stainless steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, **ASTM A307**, **Grade A** (**ISO 898-1**, **Property Class 4.6**); with hex nuts, **ASTM A563** (**ASTM A563M**); and, where indicated, flat washers.
- C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, **ASTM F593** (**ISO 3506-1**); with hex nuts, **ASTM F594** (**ASTM F836M**); and, where indicated, flat washers; Alloy Group **1** (**A1**).
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, **ASTM A563** (**ASTM A563M**); and, where indicated, flat washers.
1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- G. Post-Installed Anchors: Torque-controlled expansion anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group **1** (**A1**) stainless steel bolts, **ASTM F593** (**ISO 3506-1**), and nuts, **ASTM F594** (**ASTM F836M**).
- H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, **1-5/8 by 7/8 inches** (**41 by 22 mm**) by length indicated with anchor straps or studs not less than **3 inches** (**75 mm**) long at not more than **8 inches** (**200 mm**) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint 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 D1187/D1187M.
- G. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, **1/8 by 1-1/2 inches (3.2 by 38 mm)**, with a minimum **6-inch (150-mm)** embedment and **2-inch (50-mm)** hook, not less than **8 inches (200 mm)** from ends and corners of units and **24 inches (600 mm)** o.c., unless otherwise indicated.

2.6 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.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.7 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe or steel shapes, as indicated.
- B. Fabricate sleeves for bollard anchorage from steel or stainless steel pipe or tubing with **1/4-inch- (6.4-mm-)** thick, steel or stainless steel plate welded to bottom of sleeve. Make sleeves not less than **8 inches (200 mm)** deep and **3/4 inch (19 mm)** larger than OD of bollard.
- C. Prime steel bollards with zinc-rich primer.

2.8 ABRASIVE METAL NOSINGS, TREADS, AND THRESHOLDS

- A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Balco; a CSW Industrials Company
 - b. Nystrom, Inc.
 - c. Wooster Products Inc.
 - 2. Provide ribbed units, with abrasive filler strips projecting **1/16 inch (1.5 mm)** above aluminum extrusion.
 - 3. Nosings:
 - a. Beveled-back units, **4 inches (100 mm)** wide with **1-3/8-inch (35-mm)** lip, for surface mounting on existing stairs.
 - 4. Treads: Beveled-back units, full depth of tread with **1-3/8-inch (35-mm)** lip, for application over existing stairs.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

- C. Drill for mechanical anchors and countersink. Locate holes not more than **4 inches (100 mm)** from ends and not more than **12 inches (300 mm)** o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
 - 1. Provide two rows of holes for units more than **5 inches (125 mm)** wide, with two holes aligned at ends and intermediate holes staggered.
- D. Apply bituminous paint to concealed surfaces of cast-metal units.
- E. Apply clear lacquer to concealed surfaces of extruded units.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than **8 inches (200 mm)** unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.

2.10 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 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 not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast 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. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF 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 INSTALLATION OF METAL BOLLARDS

- A. Anchor bollards in concrete in formed or core-drilled holes not less than **42 inches (1050 mm)** deep and **3/4 inch (19 mm)** larger than OD of bollard. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately **1/8 inch (3 mm)** toward bollard.
- B. Anchor bollards in place with concrete footings. Center and align bollards in holes **3 inches (75 mm)** above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- C. Anchor internal sleeves for removable bollards in concrete by inserting in pipe sleeves preset into concrete. Fill annular space around internal sleeves solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately **1/8 inch (3 mm)** toward internal sleeve.

- D. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes **3 inches (75 mm)** above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.
- E. Place removable bollards over internal sleeves and secure with **3/4-inch (19-mm)** machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.
- F. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 1. Do not fill removable bollards with concrete.

3.4 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum **2.0-mil (0.05-mm)** dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

SECTION 06 10 00 - ROUGH CARPENTRY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Miscellaneous lumber.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than **2 inches nominal (38 mm actual)** size in least dimension.
- B. Dimension Lumber: Lumber of **2 inches nominal (38 mm actual)** size or greater but less than **5 inches nominal (114 mm actual)** size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. Lumber grading agencies, and abbreviations used to reference them, include the following:
 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. SPIB: The Southern Pine Inspection Bureau.
 4. WCLIB: West Coast Lumber Inspection Bureau.
 5. WWPAA: Western Wood Products Association.

1.3 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. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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 wood products.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.
2. Dimension Lumber: unless otherwise indicated.

- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1, Use categories as follows: 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. Do not use inorganic boron (SBX) for sill plates.
2. After treatment, redry dimension lumber to 19 percent maximum moisture content.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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 items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 - 4. Wood floor plates that are installed over concrete slabs-on-grade.
 - 5. Blocking on the exterior side of the air barrier.

2.3 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 - 1. Mixed southern pine or southern pine; SPIB.
 - 2. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 3. Eastern softwoods; NeLMA.
- C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 - 2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 - 3. Eastern softwoods; No. 2 Common grade; NeLMA.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
 - 1. Where rough 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.
 - 2. For pressure-preservative-treated wood, use stainless steel fasteners.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having

jurisdiction, based on ICC-ES AC70.

- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01,,ICC-ES AC58,,ICC-ES AC193,,or ICC-ES AC308 as appropriate for the substrate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring,nailers, blocking, grounds,and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than **16 inches (406 mm)** o.c.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than **96 inches (2438 mm)** o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than **96 inches (2438 mm)** o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and **2-inch nominal (38-mm actual)** thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than **100 sq. ft. (9.3 sq. m)** and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than **20 feet (6 m)** o.c.
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- 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.
- B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than **1-1/2 inches (38 mm)** wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install **1-by-3-inch nominal- (19-by-63-mm actual-)** size furring horizontally and vertically at **24 inches (610 mm)** o.c.

3.4 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.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00 - SHEATHING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Wall sheathing.

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.**

1. Review air-barrier and water-resistant glass-mat gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and water-resistant glass-mat gypsum sheathing.

1.3 ACTION SUBMITTALS**A. Product Data:**

1. Wall sheathing.

B. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.**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 WALL SHEATHING****A. Glass-Mat Gypsum Sheathing, Walls: ASTM C1177/C1177M.**

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

- a. CertainTeed; SAINT-GOBAIN
- b. Continental Building Products Inc.
- c. Georgia-Pacific Gypsum LLC
- d. Gold Bond Building Products, LLC provided by National Gypsum Company
- e. USG Corporation

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.

3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.2 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 of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C1002.
 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C954.

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 2304.10.1, "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. 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 INSTALLATION OF GYPSUM SHEATHING

- A. Comply with GA-253 and with manufacturer's written instructions.
 1. Fasten gypsum sheathing to wood framing with screws.
 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 3. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural

elements.

4. Install panels with a **1/4-inch (6.4-mm)** gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
1. Space fasteners approximately **8 inches (200 mm)** o.c. and set back a minimum of **3/8 inch (9.5 mm)** from edges and ends of panels.
- D. Seal sheathing joints in accordance with sheathing manufacturer's written instructions.
1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 06 16 00

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.
2. Plastic-laminate-clad casework.
3. Accessories.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

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

1. Review locations and method of attachment of backing required for casework installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Plans, elevations, sections, and attachment details.
 - a. Show large-scale details.
 - b. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - c. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.

- C. Samples for Initial Selection: For each exposed product and for each color and finish specified, in manufacturer's standard size.

- D. Samples for Verification: Provide a minimum of three samples showing the full range of color and/or grain to be

expected in the finished work, for the following.

1. Plastic Laminates: **8 by 10 inches (200 by 200 mm)**, for each type, color, pattern, and surface finish required.
 - a. Provide one Sample applied to core material with specified edge material applied to one edge.
2. Thermally Fused Laminate (TFL) Panels: **8 by 10 inches (200 by 250 mm)**, for each color, pattern, and surface finish.
 - a. Provide edgebanding on one edge.
3. Corner Pieces:
 - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, **18 inches (450 mm)** high by **18 inches (450 mm)** wide by **6 inches (150 mm)** deep.
 - b. Miter joints for standing trim.
4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For manufacturer and Installer.
- B. Product Certificates: For each type of product.
- C. Evaluation reports for fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Manufacturer of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are 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 cabinets by field measurements

before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Unless otherwise indicated, comply with ANSI/AWI 0641 for duty level and grade of architectural cabinets indicated for construction, finishes, installation, and other requirements.

2.2 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Architectural Woodwork Institute (AWI) Standard:
 - 1. Aesthetic Performance Grade: Premium.
- B. Casework Construction Type: Frameless.
- C. Door and Drawer-Front:
 - 1. Style: Flush overlay.
- D. High-Pressure Decorative Laminate (HDPL): ISO 4586-3, grades as indicated or, if not indicated, as required by quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABET Inc.
 - b. Formica Corporation
 - c. Pionite; a Panolam Industries International, Inc. brand
 - d. Wilsonart LLC
- E. Exposed Exterior Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edgebanding: PVC, 3.0 mm thick, matching laminate in color, pattern, and finish.
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- F. Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate (HDPL) cabinet liner Grade CLS, ISO 4586-3.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate.
 - 2. Drawer Sides and Backs: Thermally fused laminate (TFL) panels with PVC or polyester edgebanding.
 - 3. Drawer Bottoms: Thermally fused laminate (TFL) panels.
- G. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless

located directly under tops.

- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4586-3, grade as indicated.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws\ from interior of body. Drawer construction to hold 75lb.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range. See finish schedule in drawings.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 - d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
 - 2. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
 - 3. Particleboard (Medium Density): ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 5. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of AWI 300.

2.4 CASEWORK HARDWARE

- A. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."
 - 1. Manufacturers Subject to compliance with requirements, provide products by one of the following:
 - a. Accuride International.
 - b. Blum, Julius & Co., Inc.
 - c. Knappe & Vogt Manufacturing Company.
- B. Hinges:
 - 1. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 135 degrees of opening.
- C. Pulls and Knobs:

1. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011 75-mm
2. Wire Pulls: Back mounted, solid metal, 5 inches (127 mm) long, 5/16 inch (8 mm) in diameter, and 2-1/2 inches deep. ADA compliant.

D. Catches and Latches:

1. Push-in Magnetic Catches: ANSI/BHMA A156.9, B03132.

E. Shelf Rests and Standards:

1. Stainless steel Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.
2. Stainless Steel Shelf Rests: ANSI/BHMA A156.9, B04013; metal.

F. Drawer Slides: ANSI/BHMA A156.9.

1. Heavy-Duty (Grade 1HD-200): Side mount.
 - a. Type: Full overtravel extension.
 - b. Material: Zinc-plated ball-bearing slides.

G. Locks for Drawer and Hinged-Doors: Cylindrical (cam) type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks where indicated.

H. Hardware Finish:

1. Exposed Hardware: Provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
 - a. Satin Stainless Steel: ANSI/BHMA 630.
2. Concealed Hardware: Manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.5 ACCESSORIES

A. Grommets:

1. Wire-Management Grommets: Circular, grommets and matching caps with slot for wire passage.
 - a. Finish: Molded plastic.
 - b. Outside Diameter: 2 inches (51 mm).
 - c. Color: Selected from manufacturer's full range.

2.6 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous metal or hot-dip galvanized

anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease sharp edges and corners.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION OF CASEWORK

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of **1/8 inch in 96 inches (3 mm in 2400 mm)** using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 Inches (400 mm) o.c. with toggle bolts through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where impossible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware and other moving parts to function smoothly.
- C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION 06 41 00

SECTION 06 61 00 - ARCHITECTURAL FIBERGLASS COLUMN COVERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes fabrication of fiberglass-reinforced polyester column covers.
- B. Related Requirements:
 - 1. General Conditions, Supplementary Conditions and Division 1 General Requirements apply to the work of this section.
 - 2. Section 06 10 00, "Rough Carpentry", for blocking.
 - 3. Section 07 92 00, "Joint Sealants".

1.2 ACTION SUBMITTALS

- A. Product Data: For products of standard manufacture, not custom fabricated for this work, submit manufacturer's catalog illustrations, specifications, anchor details and installation instructions.
- B. Shop Drawings: Submit shop drawings for fabrication and erection.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples: Sample column section or fiberglass color chip for color verification as selected by Architect from manufacturer's full range.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For Architectural Fiberglass Column Covers to include in maintenance manual.

1.5 QUALITY ASSURANCE

- A. The fiberglass manufacturer shall have been engaged in the fiberglass industry for at least 10 years doing work with projects comparable in size, scope, detail, and complexity to that shown and specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide shipping crates of sufficient size and strength to protect components during shipping or ship fiberglass

components in padded dedicated moving van.

- B. Provide additional protection as may be necessary to prevent soiling of surfaces and marring of finish.

1.7 WARRANTY

- A. Special Warranty: Submit warranty on completed fiberglass components in writing against defects of materials and workmanship and to meet the specified requirement.
- B. Warranty Period: Three years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Single Source Responsibility for Architectural Fiberglass: Obtain architectural fiberglass from a single source with resources to provide products complying with requirements indicated without delaying the work.
- B. Fire Test Response Characteristics: Provide architectural fiberglass and related materials with fire test response characteristics as specified elsewhere in this section as determined by testing identical products per test method ASTM E-84 or other testing and inspecting agency acceptable to authorities having jurisdiction. Provide written certification that supplied architectural fiberglass panels meets or exceeds the criteria.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Melton Classics, Inc.
 - 2. Decoro Building Products
 - 3. Edon Fiberglass
 - 4. Architectural Fiberglass, Inc.

2.3 MATERIALS

- A. General: The fiberglass reinforced polyester plastic components shall be designed, fabricated and erected to conform to the state of Building Code, Local Codes and to the Architect's design criteria.
- B. Glass cloth, matt and "Chop" shall be equal to the products of PPG-Owens Corning. Type "E" random chopper fibers.
- C. Polyester resins when requested shall be equal to Class A, AMI Spec 67. The resin shall be flame retardant, promoted thixotropic polyester resin designed for use in hand laid up and spraying processes. The resin shall be specifically formulated for use in applications that require an ASTM E 84, Class I flame spread rating, without the use of fillers or antimony trioxide, with an ASTM E 84 flame spread rating of 25 unfilled smoke density of 380 or under.
- D. Gel Coat: The gel coat shall be a high-performance product with ultraviolet inhibitors as recommended by the gel coat and fiberglass panel manufacturer.
- E. Fiberglass-reinforced polyester components shall be manufactured using the specified resins, reinforced with

chopped glass fibers. All exposed surfaces shall be finished with custom colored gel-coat.

- F. Internal metal reinforcement, anchorage clips, brackets and all other "built-in" accessories shall be captured and additionally reinforced with additional glass fiber and matt of sufficient thickness as required by the panel manufacturers design.
- G. All metal hardware, both loose and embedded, shall be stainless steel.
- H. Gel coat thickness shall be 0.015" minimum to 0.025" maximum.
- I. Panel thickness shall be 3/16" minimum.
- J. FRP Properties, Min. Values:
 - 1. Gel Coat Thickness: 22 mils. Wet
 - 2. Bearing Strength: 9,000 psi per ASTM D638
 - 3. Shear Strength: 7,500 psi
 - 4. Flexural Strength: 20,000 psi per ASTM D790
 - 5. Flexural Modulus: 0.9 x 10⁶ psi per ASTM D790
 - 6. Tensile Strength: 12,000 psi per ASTM D638
 - 7. Compressive Strength: 17,000 psi per ASTM D695
 - 8. Relative Density (Specific Gravity): 1.5

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 column covers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate required blocking if needed with installers.
- B. Coordinate installation with any metal gutter lining work or flashing above and wood/metal substrates.
- C. Install sealant and accessories as work progresses, so as to make the work weather tight.
- D. Fill joints with a continuous bead of sealant. Tooling finished joints to a slightly concave profile ensuring complete filing and flush installation.
- E. Carefully monitor ambient temperatures at time of panel installation and observe all panels to panel clearances recommended by the fiberglass manufacturer.
- F. Do not cut or abrade finishes, which cannot be completely restored in the field. Installer to make small inconspicuous finish repairs using manufactures color matching gel fill finish. If to large of a repair is needed return to fiberglass manufacturer for alterations or new units.
- G. Use only stainless steel connectors approved by the panel manufacturer and which will develop the strength required by fiberglass panel manufacturer's calculations. The installer shall supply these connectors.

- H. Countersink all exposed fasteners. Patch all attachment holes with gel fill finish supplied by the fiberglass panel manufacturer for field application. Finish attachment points so that there is no detectable difference in the completed panel surface.
- I. Clean installed panel to remove all dirt, smudges, and construction dirt. Use only those cleaning products and procedures recommended by the fiberglass manufacturer.

3.3 CLEANING AND PROTECTION

- A. Clean according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Final Acceptance.
- C. Protect columns from damage during construction period. Remove temporary protective coverings at time of Final Acceptance.

END OF SECTION 06 61 00

SECTION 07 21 00 - THERMAL INSULATION**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Mineral-wool blanket insulation.
2. Mineral-wool board insulation.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Mineral-wool blanket insulation.
2. Mineral-wool board insulation.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than 25 and 450 when tested in accordance with ASTM E84.
- B. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Labeling: Provide identification of mark indicating R-value of each piece of insulation **12 inches (305 mm)** and wider in width.
- D. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings in accordance with ASTM C518.

2.2 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; complying with ASTM E136 for combustion characteristics. R-value and density as indicated in Drawings.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; a Berkshire Hathaway company

- b. Owens Corning
- c. ROCKWOOL

2.3 MINERAL-WOOL BOARD INSULATION

- A. Mineral-Wool Board Insulation, Type IVB : ASTM C612, Type IVB; unfaced.

- 1. Nominal Density: 8 lb/cu. ft. (128 kg/cu. m).
 - 2. R-Value: R-4.3/inch minimum.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:

- 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

- B. Miscellaneous Application Accessories:

- 1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or those that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches (100 mm) from each corner of board

insulation, at center of board, and as recommended by manufacturer.

1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members in accordance with the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 26 00 - VAPOR RETARDERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Polyethylene vapor retarders.
 - 2. Reinforced-polyethylene vapor retarders.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.
 - 2. Section 072100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Polyethylene vapor retarders.
 - 2. Reinforced-polyethylene vapor retarders.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS**2.1 POLYETHYLENE VAPOR RETARDERS**

- A. Polyethylene Vapor Retarders: ASTM D4397 and ASTM E1745, 10-mil- (0.25-mm-) thick sheet, with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).

2.2 ACCESSORIES

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- A. Place vapor retarders on side of construction indicated on Drawings.
- B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 INSTALLATION OF VAPOR RETARDERS IN CRAWL SPACES

- A. Install vapor retarders over prepared grade. Lap joints a minimum of **12 inches (305 mm)** and seal with manufacturer's recommended tape. Install second layer over pathways to equipment.
- B. Extend vapor retarder over footings and seal to foundation wall or grade beam with manufacturer's recommended tape.
 - 1. Extend vapor retarder vertically minimum **24 inches (610 mm)** above top of footing.
- C. Seal around penetrations such as utilities and columns in order to create a monolithic, airtight membrane at grade surface, perimeter, and all vertical penetrations.

3.4 PROTECTION

- A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 07 26 00

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. High-build air barriers, vapor permeable.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.2 DEFINITIONS**A. Air-Barrier Accessory:** A transitional component of the air barrier that provides continuity.**B. Air-Barrier Assembly:** The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.**C. Air-Barrier Material:** A primary element that provides a continuous barrier to the movement of air.**1.3 ACTION SUBMITTALS****A. Product Data:** Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

1. High-build air barriers, vapor permeable.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.4 QUALITY ASSURANCE**A. Installer Qualifications:** An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer to be licensed by ABAA in accordance with ABAA's Quality Assurance Program and to employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.

1. Build integrated mockups of exterior wall assembly , 150 sq. ft. (14 sq. m), incorporating backup wall

construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

- a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain primary air-barrier materials and air-barrier accessories from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Pass, when tested in accordance with ASTM E2357.
- C. Air Permeance: Maximum 0.0001 cfm/sf pressure difference; ASTM E2178.
- D. Ultimate Elongation: Minimum 250 percent; ASTM D412, Die C.
- E. Adhesion to Substrate: Minimum 140 psi (965 kPa) when tested in accordance with ASTM D4541.
- F. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- G. UV Resistance: Can be exposed to sunlight for 180 days in accordance with manufacturer's written instructions.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. High-Build, Vapor-Permeable Air Barrier, Synthetic Polymer Type: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of **70 mils (0.9 mm)** wet thickness or thicker over smooth, void-free substrates.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DuPont de Nemours, Inc.
 - b. GCP Applied Technologies Inc.
 - c. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands)
 - d. Sto Corp.
 - e. Tremco Incorporated
 - f. Prosoco, Inc.
- B. Vapor Permeance: Minimum 14 perms; ASTM E96/E96M, Procedure B, Water Method.

2.4 ACCESSORY MATERIALS

- A. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, **0.0250 inch (0.64 mm)** thick, and Series 300 stainless steel fasteners.

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 substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 - 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method in accordance with ASTM D4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier

application.

- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints and control joints discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.

3.3 INSTALLATION OF ACCESSORIES

- A. Install accessory materials in accordance with air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of **3 inches (75 mm)** of coverage is achieved over each substrate.
 - 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of **3 inches (75 mm)** of coverage is achieved over each substrate. Maintain **3 inches (75 mm)** of full contact over firm bearing to perimeter frames, with not less than **1 inch (25 mm)** of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
 - 2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier

material.

- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional **6-inch- (150-mm-)** wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending **6 inches (150 mm)** beyond repaired areas in strip direction.

3.4 INSTALLATION OF PRIMARY AIR-BARRIER MATERIAL

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier in accordance with air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than **35 mils (0.9 mm)**, applied in one or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Air-barrier dry film thickness.

3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage in accordance with ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate in accordance with ASTM E783 or ASTM E2357.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in accordance with ASTM D4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Vertical-rib, snap-joint, standing-seam metal roof panels.
2. Substrate board.
3. Roof insulation.
4. Cover board.
5. Underlayment.

B. Related Requirements:

1. Section 074293 "Soffit Panels" for metal panels used in horizontal soffit applications.
2. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.2 DEFINITIONS

- A. Structural Standing-Seam Metal Roof Panel System:** A roof system designed to resist positive and negative loads applied normal to the metal roof panel surface without the benefit of a supporting deck or sheathing.

1.3 COORDINATION

- A.** Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B.** Coordinate metal roof panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS**A. Preinstallation Conference:** Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal roof panel Installer, metal roof panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal roof panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal roof panel installation, including manufacturer's written installation instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review loading limitations of supporting structure during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal roof panels.

7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal roof panel systems during and after installation.
9. Review procedures for repair of metal roof panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data:

1. For standing-seam metal roof panels. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal roof panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than **1-1/2 inches per 12 inches (1:10)**.

C. Samples for Verification: Actual sample of finished products for each type of exposed finish for metal roof panels and metal panel accessories.

1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For roof installers.

B. Product Test Reports: For standing-seam metal roof panels, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal roof panels.

1.8 QUALITY ASSURANCE

A. Roof Installer Qualifications: Entity that employs installers and supervisors who are trained and approved by manufacturer..

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal roof panels, and other manufactured items so as not to be damaged or deformed.

Package metal roof panels for protection during transportation and handling.

- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness, with positive slope for drainage of water. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal roof panels during installation.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed in accordance with manufacturers' written installation instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal roof panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metal and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Final Acceptance.
- B. Special Weathertightness Warranty: Manufacturer agrees to repair or replace standing-seam metal roof panel systems that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal roof panel systems capable of withstanding the effects of the following loads when tested in accordance with ASTM E1592, Miami Dade County tested and compliant with Florida Building Code, and comply with ASCE-07:
 - 1. Wind Loads: design wind speed of 120 mph acting inward or outward.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E1646 or ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

- C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- D. FM Approvals Listing: Provide metal roof panels and component materials that comply with requirements in FM Approvals 4471 as part of a metal panel roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail Resistance: MH.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS, GENERAL

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with seamed joint type indicated and mechanically attaching panels to supports using concealed fasteners in side laps. Include all accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.3 VERTICAL-RIB, SNAP-JOINT, STANDING-SEAM METAL ROOF PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dimensional Metals, Inc.
 - 2. Englert, Inc.
 - 3. MBCI; Cornerstone Building Brands
 - 4. Firestone Building Products
 - 5. Petersen Aluminum Corporation
 - 6. Metal Roofing Systems, Inc.
- B. Metal Roof Panels: Formed with vertical ribs at panel edges; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
 - 1. Clips: One piece, fixed, designed to accommodate thermal movement.
 - a. Steel Clips: 0.028-inch- (0.71-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - 2. Panel Coverage: 16 inches (406 mm).
 - 3. Panel Height: 1.5 inches (38 mm).

2.4 METAL ROOF PANEL MATERIAL

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, **G90 (Z275)** coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, **Class AZ50 (Class AZM150)** coating designation; structural quality. Sheet prepainted by the coil-coating process to comply with ASTM A755/A755M.
1. Nominal Thickness: Minimum 22 gauge.
 2. Exterior Finish: Three-coat fluoropolymer.
 3. Color: As selected by Architect from manufacturer's full range, see drawings.

2.5 ROOF INSULATION

A. Insulation over Solid Deck:

1. Polyisocyanurate Board Insulation: ASTM C1289, Type II, **Class 2 coated glass-fiber facer**
 - a. Manufacturers: Subject to compliance with requirements, Provide products by one of the following:
 - 1) Atlas Polyiso Roof and Wall Insulation
 - 2) Carlisle Syntec Systems
 - 3) CertainTeed; SAINT-GOBAIN
 - 4) GAF
 - 5) Hunter Panels; a Carlisle company
 - 6) Insulfoam; a Carlisle Company
 - 7) Johns Manville; a Berkshire Hathaway company
 - b. Compressive Strength: Grade 3, **25 psi (172 kPa)**.
 - c. Size: **48 by 96 inches (1219 by 2438 mm)**.
 - d. Thickness:
 - 1) Base Layer: **2 1/2 inches**
 - e. For use on bottom layer of roof insulation.
2. Composite Polyisocyanurate Board Insulation: ASTM C1289, with factory-applied facing board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other surface.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Atlas Polyiso Roof and Wall Insulation
 - 2) Carlisle Syntec Systems
 - 3) CertainTeed; SAINT-GOBAIN
 - 4) GAF
 - 5) Hunter Panels; a Carlisle company
 - 6) Insulfoam; a Carlisle Company
 - 7) Johns Manville; a Berkshire Hathaway company
 - b. Facer: Type V oriented strand board facer, **7/16 inch (11 mm)** thick.
 - c. Size: **48 by 96 inches (1219 by 2438 mm)**.
 - d. Thickness: 2 1/2".
 - e. For use on top layer of roof insulation.

2.6 UNDERLAYMENT

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of **30 mils (0.76 mm)** 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. Provide product acceptable to Roofing Panel Manufacturer.
 2. Thermal Stability: Stable after testing at **240 deg F (111 deg C)**; ASTM D1970/D1970M.
 3. Low-Temperature Flexibility: Passes after testing at **minus 20 deg F (minus 29 deg C)**; ASTM D1970/D1970M.
 4. 120 Day UV exposure rating.

2.7 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, minimum ASTM A653/A653M, **G90 (Z275)** hot-dip galvanized coating designation or ASTM A792/A792M, **Class AZ50 (Class AZM150)** coating designation. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Roof Panel Accessories: Provide components required for a complete, weathertight metal roof panel system including trim, copings, fasciae, mullions, sills, corner units, fasteners, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 2. Backing Plates: Provide metal backing plates at roof panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum **1-inch- (25-mm-)** thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal roof panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- D. Gutters: Formed from same material as metal roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum **96-inch- (2400-mm-)** long sections, of size and metal thickness in accordance with manufacturer's recommendations. Furnish gutter supports spaced a maximum of **36 inches (914 mm)** o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- E. Downspouts: Formed from same material as metal roof panels. Fabricate in **10 ft. (3 m)** long sections, complete with formed elbows and offsets, of size and metal thickness in accordance with SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters. Strap gutters to wall beyond every 4'-0" on center. In locations where gutter spans longer than 4'-0" between roof eave and wall beyond, upsize gauge of aluminum to accommodate additional load of unstrapped gutter and 1-hour maximum water flow.
- F. Roof Curbs: Fabricated from same material as metal roof panels, **0.048-inch (1.2-mm)** nominal thickness; with bottom of skirt profiled to match metal roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of **0.060-inch- (1.52-mm-)** nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with ~~1-inch-~~ (25-mm-) thick, rigid insulation.
- G. Roof Panel Fasteners: Self-tapping screws designed to withstand design loads.
- H. Roof Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with metal roof panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape ~~1/2 inch~~ (13 mm) wide and ~~1/8 inch~~ (3 mm) thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.8 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide roof panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Seams for other than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with manufacturer's recommendations.
 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not permitted on faces of accessories exposed to view.
 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal roof panel manufacturer.
 - a. Size: As recommended by SMACA's "Architectural Sheet Metal Manual," or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.9 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples

and are assembled or installed to minimize contrast.

C. Steel Roof Panels and Accessories:

1. Three-Coat Fluoropolymer: 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. Architect to select color from manufacturer's full range.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal roof panel manufacturer's written installation instructions.

3.3 INSTALLATION OF ROOF INSULATION

- A. General: Install insulation concurrently with metal roof panel installation, in thickness indicated to cover entire surface, in accordance with manufacturer's written installation instructions.

3.4 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than **6 inches (152 mm)** staggered **24 inches (610 mm)** between courses. Overlap side edges not less than **3-1/2 inches (90 mm)**. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

- B. Felt Underlayment: Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
- C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.5 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

- A. Install metal roof panels in accordance with manufacturer's written installation instructions and approved Shop Drawings in orientation, sizes, and locations indicated. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal roof panels.
 - 2. Flash and seal metal roof panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal roof panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal roof panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal roof panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Roof Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal roof panel manufacturer.
- E. Concealed Clip, Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

- G. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 ft. (3 m)** with no joints allowed within **24 inches (610 mm)** of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than **36 inches (914 mm)** o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely **1 inch (25 mm)** away from walls; locate fasteners at top and bottom and at approximately **60 inches (1524 mm)** o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building.
- J. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- K. Pipe and Conduit Penetrations: Fasten and seal to metal roof panels as recommended by manufacturer.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panels within installed tolerance of **1/4 inch in 20 ft. (6 mm in 6 m)** on slope and location lines as indicated and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel

installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

SECTION 07 42 93 - SOFFIT PANELS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Metal soffit panels.

B. Related Requirements:

1. Section 074213.13 "Formed Metal Wall Panels" for lap-seam metal wall panels.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS**A. Product Data:**

1. Metal soffit panels.

B. Product Data Submittals:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than **1-1/2 inches per 12 inches (1:10)**.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: **12 inches (305 mm)** long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS**A. Qualification Data:** For Installer.**B. Product Test Reports:** For each product, tests performed by a qualified testing agency.**C. Sample Warranties:** For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Final Acceptance.
 - B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty
- SOFFIT PANELS

period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

- A. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dimensional Metals, Inc.
 - b. Englert, Inc.
 - c. MBCI; Cornerstone Building Brands
 - d. PAC-CLAD; Petersen; a Carlisle company
 - e. Firestone Building Products
 - f. Metal Roofing Systems, Inc.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: Minimum 22 Gauge.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Panel Coverage: 12 inches (305 mm).

4. Panel Height: 0.875 inch (22 mm).

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
 - a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 INSTALLATION OF METAL SOFFIT PANELS

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (610 mm)** of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 93

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: Custom flashing and trim fabrications, made from the following:
 - 1. Sheet metal materials.
- B. Related Requirements:
 - 1. Coordinate work of this section with work of Sections 040120, 061600, 074213.
- C. Provide all labor, materials, equipment, and supervision necessary for fabrication and installation of metal flashings, fascia, cleats, counter-flashings, trim, and accessories, as specified herein and as required by detail drawings.

1.2 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this section as they apply to the provision and installation of components specified herein.
- B. Qualifications of Manufacturer/Fabricator:
 - 1. Products used in the work included in this section shall be produced by manufacturers regularly engaged in the manufacture of specified items and with a history of successful production for a minimum of 10 years in the United States.
 - 2. Sheet metal flashings and trim must be fabricated in accordance with the requirements of SMACNA and the NRCA with adequate fabrication equipment to provide required profiles and prevent damage to pre-finish.
 - 3. The fabricator shall have appropriate zinc-friendly equipment and personnel trained by the zinc rolling mill capable of producing quality zinc flashing & trim profiles.
- C. Qualifications of Installer:
 - 1. The installer must have experience installing sheet metal on projects of equal to greater size, for a minimum of five (5) years.
 - 2. The installer must have adequate number of skilled workmen, thoroughly trained and experience in the necessary craft. Workers performing installation must be led by a job foreman with a minimum of three (3) years' experience in the type of installation specified whenever work installed will become part of a warranted roof system (including related flashing work). In determination of acceptance or rejection of work, no allowance will be made for lack of skill on the part of the workmen.
 - 3. The project foreman must be capable of communicating fluently in English or a full-time translator must be provided and identified by the installer. The translator must be on site at all times that the crew and foreman are present.
 - 4. Attend a Pre-Installation Conference at the project site prior to the start of roofing and wall panel installation to coordinate flashing work.

1.3 SUBMITTALS

- A. Provide a complete list of materials proposed for use including product data sheets and SDS for each product including accessory materials (fasteners, sealants, etc.). When multiple products, thicknesses, etc. are shown on a single product data sheet, identify specific components intended for use. For fasteners identify exact fastener type, material, and locations intended for use. Product data provided must be sufficient to confirm that materials meet these specifications.
- B. Provide color chart(s) for selection of pre-finished metal colors. Provide sample color chips upon request by the Designer. For sheet metal provided by a manufacturer different from the metal roof system manufacturer, the color must be able to be obtained that matches the color of the roof panels/flashing exactly. The Owner may elect to choose a second pre-finished metal color for isolated flashings (portions of wall panel, downspouts, etc.).
- C. Provide Shop Drawings indicating material types, gauges, profiles, jointing patterns and details, fasteners and fastening methods, terminations, locations of field-applied sealants, colors, to clearly indicate interaction between sheet metal flashings and roof components. Shop drawings for sheet metal components may be incorporated into shop drawings for the standing seam metal roof system.
- D. Provide confirmation that perimeter detailing submitted in the shop drawings meets the requirements of ANSI/SPRI ES-1.
- E. Provide a sample copy of the manufacturer's standard pre-finish warranty.

1.4 MOCKUPS

- A. Mock-Ups: The Contractor may be requested to perform in-place mock-up installations of representative coping, fascia, counterflashing, rake, and other flashing installations to ensure that detailing is understood, and level of workmanship is acceptable prior to the start of full sheet metal fabrication/installation. If accepted, mock-up installations may remain in place as part of the new installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal materials and accessories with original protective wrap or boxing with labels intact and legible. Comply with manufacturer's published instructions for storage and handling to prevent staining, denting, scratches, or other surface damage.
- B. Store materials in dry protected areas, on clean, raised platforms with securely anchored weather protective coverings and in such manner as to prevent condensation or staining. Stack material to prevent twisting, bending, or abrasion.
- C. During storage prevent material contact with any substance that would discolor or stain, including soil and water.
- D. Handle pre-finished sheet metal and products in a manner to reduce damage and scratching. Pad or tape equipment and breaks and use gloves to minimize fingerprinting.

1.6 SCHEDULING

- A. The Contractor shall field verify existing conditions prior to fabrication of sheet metal components. Minor dimensional detail changes may be required to fit existing conditions. Field verification must be performed with enough time to revise shop drawings and to allow for proper fabrication of components without project delay.
- B. Sheet metal work shall be closely coordinated with the installation of new roof and wall panel system materials.

Proper sequence of work will be critical to proper installation of the sheet metal flashings and trim.

- C. Sheet metal installations shall be scheduled such that system terminations will not be left unprotected.

1.7 WARRANTY

- A. Provide a Contractor's Two-Year Warranty for work included in this project in accordance with Section 014000 of these specifications.
- B. Pre-Finish Warranty: Pre-finished sheet metal shall have a 20-year finish warranty stating that the pre-finish will be free of fading or color change in excess of 5 NBS units in accordance with ASTM D-2244; will not chalk in excess of numerical rating of 7 in accordance with ASTM D 659; and will not peel, crack, chip or delaminate.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Acceptable metal flashing material includes pre-finished 22-gauge galvalume steel, 8mm/22-gauge Titanium zinc alloy coil/sheet, and 22-gauge stainless-steel sheet meeting the following requirements. Flashings shall be compatible with the panel materials in Section 074213-Formed Metal Wall Panels, color to be selected by the Architect. Provide pre-finished color sample chips to confirm color selections.
- B. Pre-Finished Galvalume Metal Flashing
 - 1. Coating: Shall be pre-finished with a two-coat, coil-applied, baked-on fluoropolymer coating system based on Kynar 500 Fluorocarbon coating with a top side total dry film thickness of 1.0 mils (minimum); bottom side shall be coated with a primer/wash with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, fading, chalking, peel resistance and longevity in accordance with ASTM D 659-80 (chalk rating of 8 or less) and ASTM D 2244-79 (5 NBS units or less). Colors for pre-finished metal shall be selected by the Owner Provide color chip samples for review and approval. The Owner may elect to choose more than one sheet metal color for wall panels and trim/flashings dependent upon location.
 - 2. Pre-Finished Metal flashings (Rake Trim, Eave Trim, Fascia, flashings, etc.): System flashing, and miscellaneous trim installed as a part of the standing seam metal roof and wall panel system shall be 22-gauge, galvalume steel substrate to match the roof panel substrate material unless otherwise specifically noted in the design details.
- C. Titanium Zinc Alloy Coil/Sheet Flashing
 - 1. Material shall be supplied by the roof/wall panel manufacturer shall meet the following: Titanium Zinc Alloy whose base is electrolytic high grade with a 99.995 % Zn degree of purity and alloying additives of 0.08% - 1.0% copper and 0.07% - .12% titanium, .001% - .015% aluminum in accordance with ASTM B69-16 (or latest edition) – Architectural Rolled Zinc - Type 1 and Type 2.
 - 2. Minimum Flashing Thickness: 0.8 mm (22 ga.) or as required to minimize oil-canning & provide acceptable wind resistance.
- D. Stainless-Steel Flashing
 - 1. Material shall be ASTM Type 304 Stainless steel. Minimum flashing thickness shall be 22-gauge or as required to minimize oil-canning & provide acceptable wind resistance.
- E. Cleats: Continuous cleats, offset cleats: Cleat materials shall match the type of the flashing material that will be attached to them and shall be one gauge heavier than the material they are securing unless otherwise noted

herein or on the design details. Where cleats may be visible, match the pre-finished color of the metal they are securing.

- F. Support Plates/Angles/Closures: Minimum 20-gauge stainless- steel unless otherwise noted in the design details.

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Shall be type and size as required by construction. Specific fastener types and sizes should be noted on roofing shop drawings for approval by the Designer. When fasteners will be covered by membrane flashings or sheet metal, head profiles should be selected to minimize pressure on the backside of covering materials or fasteners should be countersunk slightly.
 - 1. For metal-to-metal fasteners, use self-tapping, self-drilling, no. 12 stainless steel sheet metal screws. When exposed use fasteners with integral EPDM washers.
 - 2. For concealed fastening into wood, use No. 10, stainless steel, self-drilling wood screws. Minimum embedment shall be 1-1/2".
 - 3. For exposed fastening into wood, use stainless-steel self-drilling screws with integral EPDM washers.
 - 4. For fastening into masonry and concrete, use 1/4" diameter, masonry/concrete anchors with neoprene washers. Use all metal stainless-steel anchors only, no plastic or nylon anchors allowed. Minimum embedment shall be 1". Do not use drive pins without advance approval, provide pre-drilled fasteners to prevent damage/spalling to the substrate.
- B. Pop Rivets: Shall be 1/8 inch to 3/16-inch diameter with stainless-steel mandrels and washers, color clad to match pre-finished metal.
- C. Tape Sealant: Shall be a 7/8" x 3/16" butyl tape sealant with a double bead. Tape sealant shall be non-curing, non-skinning, non-staining, non-corrosive, non-shrinking, non-oxidizing, non-toxic and non-volatile. Composition shall be 99% minimum solids with a butyl base meeting performance standard in Federal Specification TT-C-1796A; Type II, Class B. Service temperature shall be -60 degrees F to +212 degrees F. Tape sealant will not be used at exposed locations.
- D. Gunnable Sealant: Elastomeric sealant shall be low modulus, non-staining, non-sag, one-part silicone sealant of gun-grade consistency. Sealant shall be easily workable and shall be capable of producing a smooth attractive finish. Provide ASTM C 920, Type S, Grade NS, Class 100/50, Use NT, M, G, A, O. Sealant shall be Dowsil 790, by Dow Chemical Company; Sikasil WS-290, by Sika Corporation, or approved equal. Sealant warranty shall comply with requirements of Section 079200.
- E. Solder for Zinc alloy flashing: Lead solder containing 50% tin and 50% lead in accordance with ASTM B32 – 08 (or latest edition) or lead-free solder. Flux: Felder ZD-Pro or equal.
- F. Other Accessories: Provide other components not specifically listed herein but required for complete and proper installation of the sheet metal flashings.

2.3 FABRICATION, GENERAL

- A. In addition to complying with all pertinent codes and regulations, comply with pertinent recommendations as noted in "Architectural Sheet Metal Manual", as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). When recommendations conflict with the requirements of the specifications, follow the more stringent requirement or contact the Designer to request clarification.
- B. Fabricate and install sheet metal sections in 10-foot lengths except where shorter lengths are required by construction.

- C. Form sections square, true, and accurate to size, free from distortion, sharp edges, and other defects detrimental to appearance or performance. Shop-fabricate sheet metal sections to the maximum extent possible.
- D. Junctures, intersections, corners, and unions of sheet metal shall be held to 18-inch legs or less.
- E. At all locations where new sheet metal sections abut walls or terminate, the sheet metal flashings shall turn up the wall and be terminated in a watertight condition. Top edge and sides shall be covered with a counterflashing with a reglet mount into masonry or extending behind new wall panel. Seams shall be soldered or welded unless otherwise indicated to have rivets and sealant. Sealant installation at such transitions is acceptable but shall not constitute the sole/main waterproofing component of the component.
- F. Sheet metal flashing shall be fabricated and installed to allow for expansion and contraction of the component materials without buckling, hole elongation, fastener failure, or excess stress loading situations developing at any time during the temperature cycle. Cleats, brackets, and clips shall be designed and installed to resist rotation and to avoid shear stress when roofing materials expand and contract.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS AND PREPARATION

- A. Inspect substrates to verify they are clean, smooth, free of depressions, waves, or projections and solidly supported over joints.
- B. Verify masonry repair work has been completed prior to installation of flashings.

3.2 INSTALLATION OF SHEET METAL FLASHING AND TRIM, GENERAL

- A. Form and install roof and wall panel system flashings in accordance with the detail drawings and approved shop drawings.
- B. Dissimilar metals shall be kept separated to prevent galvanic action. Preventive measures shall include separation by suitable bituminous paint, underlayment, or other non-conductive separation membrane acceptable to the Designer.
- C. Exposed edges of sheet metal shall be folded back, or "hemmed" ½", on concealed surfaces.
- D. Finish sheet metal watertight and weathertight. Lock seams and end joints. Fit flashings tight in-place. Make corners square, surfaces true, and plane surfaces free from warps and buckles. Do not bend flashing around corners or cut/split hemmed edge at outside corners. Corners must be tightly mitered.
- E. Make seams and joints lap in the direction of water flow. Where end laps/seams do not have a separate joint cover, lap a minimum of 4 inches.

3.3 COUNTERFLASHINGS

- A. Form and install new counter flashings at curbed equipment, along wall transitions, and at other locations shown on the design details. Exact counterflashing length and profile will vary based on configuration of roofing detail. Adjacent counterflashing pieces shall overlap each other a minimum of 4" in the direction of slope (when applicable).
- B. Counter flashings shall be secured to the curb or adjacent flashings at 6" o.c. unless otherwise noted on the

design details.

- C. Miter counterflashing corners so they nest together without gaps, sharp edges, or open/split corners. Do not cut/split and bend counterflashing around corners.

3.4 CLEANING

- A. Clean and neutralize all sealant and other materials from the flashing and roof surfaces. Remove loose fasteners from the roof and site on a daily basis.
- B. Remove any protective plastic materials from the surfaces of the pre-finished metals promptly upon installation.
- C. Handprints, smudges, and other superficial stains that were placed on the sheet metal during fabrication and installation shall be removed.
- D. Abrasions, scratches, scrapes, etc. shall be touched up with paint furnished by the sheet metal manufacturer.

3.5 FIELD QUALITY CONTROL

- A. A set of plans, details, and specification sections shall be in the possession of the project foreman at all times during roof system installation. On-site roofing personnel must be familiar with the requirements of the design documents for the specific project.
- B. Correct defects and irregularities documented by the Designer or Owner's representative promptly upon notification.
- C. Contractor may be requested to install in-place mock-ups of standard sheet metal installations (fascia, counterflashing, etc.) to allow for Designer review and to ensure acceptable installation prior to continuing with full installation.

END OF SECTION 07 62 00

SECTION 07 72 00 - ROOF ACCESSORIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: Manufactured units for the following applications:
 - 1. Roof curbs.
 - 2. Preformed flashing sleeves.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for roof cants, nailers, blocking, and other pressure-preservative-treated wood.
 - 2. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.
 - 3. Section 079200 "Joint Sealants" for field-applied sealants between roof accessories and adjacent materials.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
 - 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Samples: For each type of roof accessory and for each color and texture specified, prepared on samples of size to adequately show color.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items, including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof accessories in contact with other materials that might cause staining, denting, or other surface damage. Store roof accessories in accordance with manufacturer's instructions.
- B. Store materials off ground in dry location and in accordance with manufacturer's instructions in well-ventilated area.
- C. Store and protect roof accessories from nicks, scratches, and blemishes.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-accessory substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories 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 accessories to 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. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

- A. Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AES Industries, Inc
 2. Curbs Plus, Inc
 3. Custom Solution Roof and Metal Products, a division of Colony Heating
 4. Greenheck Fan Corporation
 5. Roof Products, Inc.
 6. Thybar Corporation
 7. Milcor Commercial Products Group of Hart & Cooley, Inc.
- C. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- D. Stainless Steel: 0.0781 inch (1.983 mm) thick sheet.
1. Finish: Manufacturer's standard.
- E. Construction:
1. Curb Profile: Manufacturer's standard compatible with roofing system.
 2. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
 3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 4. Sloping Roofs: Where roof slope exceeds 1/4 inch per 12 inches (1:48), fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
 5. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
 6. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 7. Wind-Restraint Straps and Base Flange Attachment: Provide wind-restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to comply with wind-uplift requirements.
 8. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and slotted metal collar.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Solution Roof and Metal Products, a division of Colony Heating
 - b. Menzies Metal Products
 - c. Thaler Metal Industries Ltd.
 2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
 3. Diameter: As indicated on Drawings.
 4. Finish: Manufacturer's standard.
- B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Custom Solution Roof and Metal Products, a division of Colony Heating
 - b. Menzies Metal Products
 - c. Milcor by Duravent; Duravent Group.
 - d. Thaler Metal Industries Ltd.
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
 3. Height: 13 inches (330 mm).
 4. Diameter: As indicated on Drawings.
 5. Finish: Manufacturer's standard.

2.4 METAL MATERIALS

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheer complying with minimum ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality.
- B. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 1. Mill Finish: As manufactured.
- C. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.

2.5 UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBSmodified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
- B. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, thickness as indicated.
- C. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.
- D. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- F. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install roof accessories in accordance with manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- 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 in writing by manufacturer's written installation instructions.
 - 1. Coat concealed side of uncoated aluminum and stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

3.3 INSTALLATION OF ROOF ACCESSORIES

- A. Roof Curb: Install each roof curb so top surface is level.
- B. Equipment Support: Install equipment supports so top surfaces are level with each other.
- C. Pipe and Duct Support: Comply with MSS SP-58. Install supports and attachments as required to properly

support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
- D. Preformed Flashing-Sleeve and Flashing-Pipe Portal: Secure flashing sleeve to roof membrane in accordance with flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane in accordance with roof membrane manufacturer's instructions.
- E. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.4 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 22 53 - SNOW GUARDS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Pad-type, flat-mounted metal snow guards.

1.2 ACTION SUBMITTALS**A. Product Data:** Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.**B. Shop Drawings:** Include roof plans showing layouts and attachment details of snow guards.

1. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish..

C. Samples:

1. Pad-Type Snow Guards: Full-size unit with installation hardware.

1.3 INFORMATIONAL SUBMITTALS**A. Product Test Reports:** For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.**1.4 FIELD CONDITIONS****A. Weather Limitations:** Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS****A. Performance Requirements:** Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Structural Performance: Snow guards to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Snow Loads: As indicated on Drawings.

2.2 PAD-TYPE SNOW GUARDS

A. Pad-Type, Flat-Mounted Metal Snow Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpine SnowGuards
 - b. Sno-Gem, Inc.
 - c. SnowGuard
2. Material.: Manufacturer's standard noncorrosive metal.
3. Finish and Color: Powder coat; color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates for bonding snow guards.
- B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
 1. Space rows as recommended by manufacturer.
- B. Attachment for Standing-Seam Metal Roofing:
 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.

END OF SECTION 07 72 53

SECTION 07 92 00 - JOINT SEALANTS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.

B. Related Requirements:

1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
2. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.****1.3 ACTION SUBMITTALS****A. Product Data:**

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.

B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in ~~1/2-inch-~~ (13-mm-) wide joints formed between two ~~6-inch-~~ (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.**1.4 INFORMATIONAL SUBMITTALS****A. Preconstruction Field-Adhesion-Test Reports:** Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.**1.5 MOCKUPS****A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.****1.6 PRECONSTRUCTION TESTING****A. Preconstruction Field-Adhesion Testing:** Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
5. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
6. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
7. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD 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 or are below 40 deg F (5 deg C).
 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.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, 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 joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Adfast
- b. GE Construction Sealants; Momenive Performance Materials Inc.
- c. Pecora Corporation
- d. Sika Corporation - Building Components
- e. The Dow Chemical Company

2.4 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Adfast
 - b. GE Construction Sealants; Momenive Performance Materials Inc.
 - c. Pecora Corporation
 - d. Sika Corporation - Building Components
 - e. The Dow Chemical Company
 - f. Tremco Incorporated

2.5 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Adfast
 - b. Pecora Corporation
 - c. PPG Paints; PPG Industries, Inc.
 - d. Sherwin-Williams Company (The)
 - e. Sika Corporation - Building Components
 - f. Tremco Incorporated
 - g. Master Builders Solutions; brand of MBCC Group

2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Manufacturers: Subject to compliance with requirements, undefined:
 - a. Adfast
 - b. Alcot Plastics Ltd.
 - c. Construction Foam Products; a division of Nomaco, Inc.

- B. Cylindrical Sealant Backings: ASTM C1330, or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 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. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- 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 performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, 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. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

- a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. 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.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
- 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings in accordance with Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at in accordance with Figure 8C in ASTM C1193.
- a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Exterior standard steel doors and frames.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS**A. Product Data:**

1. Exterior standard steel doors and frames.
2. Exterior custom hollow-metal doors and frames.

B. Product Data Submittals: For each product.**C. Shop Drawings: Include the following:**

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.

6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

D. Samples for Verification:

1. Finishes: For each type of exposed finish required, prepared on Samples of not less than **3 by 5 inches (75 by 127 mm)**.
2. Fabrication: Prepare Samples approximately **12 by 12 inches (305 by 305 mm)** to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum **4-inch- (102-mm-)** high wood blocking. Provide minimum **1/4-inch (6-mm)** space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 HOLLOW METAL DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; AADG, Inc.; ASSA ABLOY
 2. Curries, AADG, Inc.; ASSA ABLOY Group
 3. Deansteel Manufacturing Company, Inc.
 4. Fleming Door Products Ltd.; ASSA ABLOY Group

5. Karpen Steel Custom Doors & Frames
6. LaForce, LLC
7. Mesker Door; Mesker Openings Group
8. Pioneer Industries; AADG, Inc.; ASSA ABLOY
9. Republic Doors and Frames; a Allegion brand
10. Security Metal Products; a brand of ASSA ABLOY
11. Steelcraft; Allegion plc

2.2 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each **24 inches (610 mm)** of frame height above **7 feet (2.1 m)**.
3. Postinstalled Expansion Anchor: Minimum **3/8-inch- (9.5-mm-)** diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), **04Z (12G)** coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications for interior frames and doors.

B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B. for exterior frames and doors.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

E. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

2.4 FABRICATION

A. Hollow-Metal Frames: Fully welded.

1. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.5 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

- a. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
 3. Smoke-Control Doors: Install doors in accordance with NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 31 13 - ACCESS DOORS AND FRAMES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Flush access doors with concealed flanges.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum **6 by 6 inches** in size.
- C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

PART 2 - PRODUCTS**2.1 ACCESS DOORS AND FRAMES**

- A. Flush Access Doors with Concealed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACUDOR Products, Inc
 - b. Babcock-Davis
 - c. JL Industries; Activar Construction Products Group, Inc.
 - d. Karp Associates, Inc
 - e. Milcor by Duravent; Duravent Group.
 - f. Nystrom, Inc.
 - 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
 - 3. Locations: Wall and ceiling.
 - 4. Door Size: 18"x18" or as indicated in drawings..
 - 5. Uncoated Steel Sheet for Door: Nominal **0.060 inch**, 16 gage, factory primed.
 - 6. Frame Material: Same material and thickness as door.
 - 7. Latch and Lock: Prepared for mortise cylinder.

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
- ACCESS DOORS AND FRAMES

complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.

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 mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

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 unacceptable. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION OF ACCESS DOORS AND FRAMES

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13

SECTION 08 33 23 - OVERHEAD COILING DOORS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats, including full vision window secured to slat.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.3 CLOSEOUT SUBMITTALS
1.4 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of final acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in ICC A117.1.
- B. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
1. Design Wind Load: As indicated on Drawings.
 2. Testing: According to ASTM E330/E330M.
 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

2.2 DOOR ASSEMBLY

- A. Operation Cycles: Door components and operators capable of operating for not less than 100,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.
- B. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. (2.03 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to **ASTM E283**.
- C. STC Rating: 26.
- D. Insulated Door Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.
1. Fenestrated Slats: Approximately 3- by 5/8-inch (76- by 16-mm) openings spaced approximately 1-1/2 inches (38 mm) apart and beginning 12 inches (305 mm) from jamb guides.
 2. Insulated-Slat Interior Facing: Metal.
 3. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from stainless steel and finished to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- I. Hood: Match curtain material and finish.

1. Shape: Round.
2. Mounting: As indicated on Drawings.

J. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside and outside with cylinders.

K. Curtain Accessories: Equip door with weatherseals.

L. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Finish as selected by Architect from manufacturer's full range.

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: **0.040-inch- (1.02-mm-)** thick aluminum sheet complying with **ASTM B209 (ASTM B209M)**, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.5 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Section 087100 "Door Hardware" and keyed to building keying system.
2. Keys: Three for each cylinder.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.6 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of

curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.7 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and

equipment.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.4 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

END OF SECTION 08 33 23

SECTION 08 56 53 - SECURITY WINDOWS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Sliding, transaction security windows.

B. Related Requirements:

1. Section 099123 "Interior Painting" for field painting interior security windows.

1.2 COORDINATION

- A. Coordinate installation of anchorages for security windows. 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 adjacent construction.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS**A. Product Data: For each type of product.**

1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachment details.
2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
3. Location of weep holes.
4. Hardware for sliding window units.
5. Glazing details.
6. Details of transaction counter.

C. Samples for Initial Selection: For frame members with factory-applied color finishes.**D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:**

1. Framing: 12-inch- (305-mm-) long sections of frame members.
2. Transaction Drawer: 6 inches (150 mm) square.

E. Cutaway Sample: Corner of security window, made from 12-inch (305-mm) lengths of full-size components, and showing details of the following:

1. Joinery.
2. Anchorage.
3. Glazing.
4. Flashing and drainage.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Examination reports documenting inspections of substrates, areas, and conditions.
- D. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- E. Field quality-control reports documenting inspections of installed products.
 1. Field quality-control certification signed by Contractor.
- F. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.
- B. Label security window packaging with drawing designation.
- C. Store crated security windows on raised blocks to prevent moisture damage.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 SEQUENCING

- A. Field Painting: Except where security windows have been preglazed before installation, complete field painting of security windows before glazing installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or
- SECURITY WINDOWS

workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including deflections exceeding **1/4 inch (6 mm)**.
 - b. Failure of welds.
 - c. Excessive air leakage.
 - d. Faulty operation of sliding window hardware.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: Three years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Loads: Security windows withstand the effects of wind loads, with no permanent deformation or breakage of components within window assembly when tested in accordance with ASTM E330/E330M.
 1. Wind Loads: As indicated on Drawings.
- B. Air Leakage, Operable Window: Not more than **0.37 cfm/ft. (0.18 L/s per m)** of sash crack length at an inward test pressure of **6.24 lbf/sq. ft. (298 Pa)** when tested in accordance with ASTM E283.
- C. Water Penetration under Static Pressure, Operable Windows: Provide windows that do not evidence water leakage through operable units for 15 minutes when window is subjected to a rate of flow of **5 gal./h per sq. ft. (0.05 L/s per sq. m)** with a differential pressure across the window of **6.24 lbf/sq. ft. (298 Pa)** when tested in accordance with ASTM E331.
- D. Energy Performance: To match energy code summary in drawings.

2.2 SLIDING, TRANSACTION SECURITY WINDOWS

- A. Sliding, Transaction Security Windows: Provide sliding, transaction security windows.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C.R. Laurence Co., Inc.; CRH Americas, Inc.
 - b. Creative Industries, Inc
 - c. Krieger Specialty Products Company
 - d. Protective Structures, Ltd.
 - e. Quikserv, Inc.
 - f. Ready Access
- B. Configuration: One fixed-glazed panel and one horizontal-sliding glazed panel.
- C. Operation: Manual open/manual closing.
- D. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:
 1. Profile: Narrow, with minimum face dimension indicated.
 - a. Minimum Face Dimension: **2 inches (50 mm)**.

2. Depth: Manufacturer's standard.
 3. Provide thermally broken construction for aluminum framing.
- E. Head and Jamb Framing: Designed for gasket glazing. Removable header access panel on secure side.
- F. Sill: Stainless steel channel frame designed for gasket glazing.
- G. Sliding Window Hardware: Provide roller track designed for overhead support of heavy-duty, antilift ball-bearing carrier supporting horizontal-sliding glazed panel. Provide manufacturer's standard pull and lock with two keys for each horizontal-sliding glazed panel.
1. Provide weather stripping for exterior horizontal-sliding, transaction security windows.
- H. Materials:
1. Aluminum Extrusions: **ASTM B221 (ASTM B221M)**. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than **22,000-psi (150-MPa)** ultimate tensile strength.
 2. Aluminum Sheet and Plate: **ASTM B209 (ASTM B209M)**.

2.3 FABRICATION

- A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.
1. Provide units that are reglazable from the secure side without dismantling the attack side of framing.
 2. Prepare security windows for field glazing unless preglazing at the factory is indicated.
- B. Provide weep holes and internal water passages for exterior security windows to conduct infiltrating water to the exterior.
- C. Thermally Improved or Thermally Broken Construction: Fabricate framing with an integral, concealed, low-conductance thermal barrier, located between exterior materials and members exposed on interior in a manner that eliminates direct metal-to-metal contact.
- D. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.
1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.
- E. Glazing Stops: Finish glazing stops to match security window framing.
1. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.
- F. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- G. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- H. Factory-cut openings in glazing for speaking apertures.
- I. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated. Installation orientation of glazing to meet performance requirements. Comply with requirements in Section 088853 "Security

Glazing."

- J. Weather Stripping: Factory applied.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 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.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum **3/16 inch (4.8 mm)** thick; with minimum **1/2-inch- (12.7-mm-)** diameter, headed studs welded to back of plate.
- C. Glazing Strips and Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Molded EPDM or neoprene gaskets complying with ASTM D2000, Designations 2BC415 to 3BC620; molded PVC gaskets complying with ASTM D2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric backing.
- D. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.
 - 1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
 - 2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
 - 3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- G. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant remains permanently elastic, nonshrinking, and nonmigrating.

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 security windows.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.
- D. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- E. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
 - 1. Install an attached or integral flange to secure side of security windows extending over rough-in opening gap so that gap has same performance as security window.
- B. Glazed Framing: Provide gasket-glazed framing. Comply with installation requirements in Section 088853 "Security Glazing."
- C. Removable Glazing Stops and Trim: Fasten components with security fasteners.
- D. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials.
- E. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.

1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.5 ADJUSTING

- A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.
- B. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
 1. Lubricate sliding security window hardware.
- B. Provide temporary protection to ensure that security windows are without damage at time of Final Acceptance.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain operable security windows.

END OF SECTION 08 56 53

SECTION 08 71 00 - DOOR HARDWARE**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Hinges.
2. Continuous, gear-type hinges.
3. Mortise locks.
4. Operating trim.
5. Thresholds.
6. Metal protective trim units.
7. Auxiliary door hardware.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
2. Section 083113 "Access Doors and Frames" for access door hardware, except cylinders.
3. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.

1.2 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field-verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.3 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 electrified door hardware.

1. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Schematic diagram of systems that interface with electrified door hardware.
 - c. Point-to-point wiring.
 - d. Risers.
 - e. Elevations doors controlled by electrified door hardware.
 2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Initial Selection: For each finish, color, and texture required for each type of door hardware indicated.
- D. Samples for Verification: For each type of exposed product, in each finish specified.
1. Sample Size: Full-size units or minimum **2-by-4-inch** Samples for sheet and **4-inch** long Samples for other products.
- E. Other Action Submittals:
1. Door Hardware Sets: Prepared by Installer, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - b. Format Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - 9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - 10) List of related door devices specified in other Sections for each door and frame.
 - d. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
 - e. Submittal Sequence Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the

final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

- F. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish 3 dozen extra screws and other fasteners of each size, type, and finish used with the hardware items provided.
 2. Extra materials shall be stored on-site as directed by Owner.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer..
1. Installer's responsibilities include supplying and installing door hardware.
 2. Warehousing Facilities: In Project's vicinity.
 3. Scheduling Responsibility: Preparation of door hardware and keying schedule.
 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lockup for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys to Owner by registered mail or overnight package service.
1. Permanent cores shall be installed by General Contractor at date of acceptance by Owner.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures, including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Three years from date of Final Acceptance unless otherwise indicated below:

- a. Electromagnetic and Delayed-Egress Locks: Five years from date of Final Acceptance.
- b. Exit Devices: Three years from date of Final Acceptance.
- c. Manual Closers: 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of door hardware from single manufacturer.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- C. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- E. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- F. Accessibility Requirements: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1 for door hardware on doors in an accessible route.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 - 4. Closers: Adjust door and gate closer sweep periods so that, from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.

2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

2.2 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated on Floor Plans and Door Hardware Sets indicated in Part 3 "Door Hardware Sets" Article.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products and products equivalent in function and comparable in quality to named products and products complying with BHMA standard referenced.
2. Sequence of Operation Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.3 HINGES

A. Hinges: ANSI/BHMA A156.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; ASSA ABLOY Accessories and Door Control Groups, Inc.; ASSA ABLOY.
 - c. PBB, Inc.
 - d. STANLEY; dormakaba USA, Inc.

B. Template Hinge Dimensions: BHMA A156.7.

- C. Quantity: Provide the following, unless otherwise indicated:
 - 1. Three Hinges: For doors with heights 61 to 90 inches.
- D. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- E. Hinge Weight: Unless otherwise indicated, provide the following:
 - 1. Doors with Closers: Antifriction-bearing hinges.
 - 2. Interior Doors: Standard-weight hinges.
- F. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Interior Hinges: Steel, with steel pin.
 - 2. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- G. Fasteners: Comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Wood Screws: For wood doors and frames.
 - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 - 4. Screws: Phillips flat-head. Finish screw heads to match surface of hinges.

2.4 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.
 - 2. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.5 LOCK CYLINDERS

- A. Standard Lock Cylinders: ANSI/BHMA A156.5, Grade 1 .
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Seven.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Manufacturers: Same manufacturer as for locks and latches.

2.6 KEYING

- A. Keying System: Unless otherwise indicated, provide factory registered keying system, complying with the following requirements

1. Existing System:
 - a. Master key or grand master key locks to Owner's existing University Housing system (Best Lock).

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "STATE OF NC DUPLICATION PROHIBITED (KS603)."
 - b. Quantity: Supply three (3) extra key blanks for each lock.

2.7 KEY CONTROL SYSTEM

A. Key Lock Boxes: Recessed Mounted, 6" x 3-1/4" x 2", satin aluminum.

1. Manufacturers Subject to compliance with requirements, provide products by the following
 - a. Bommer.
 - b. Knox company.
 - c. Salsbury Industries.

2.8 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." and North Carolina State Building Code, Vol. 1-C.

1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Power-Assist Closers: As specified in Division 08 Section "Automatic Door Operators" for access doors for people with disabilities or where listed in the door hardware sets.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

E. Surface Closers: BHMA A156.4, Grade 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated. Closers shall be through bolted to the doors.

1. Manufacturers
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - b. LCN Closers; an Ingersoll-Rand Company (LCN).
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

2.9 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.
- C. Manufacturers
 - 1. Hager Companies (HAG).
 - 2. Rockwood Manufacturing Company (RM).
 - 3. Trimco (TBM).

2.10 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material.
 - 1. Material: 0.050-inch- thick stainless steel.
 - 2. Manufacturers
 - a. Hager Companies (HAG).
 - b. Rockwood Manufacturing Company (RM).
 - c. Trimco (TBM).

2.11 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
 - 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame.
- C. Manufacturers:
 - 1. Hager Companies (HAG).
 - 2. Rockwood Manufacturing Company (RM).
 - 3. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - 4. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - 5. Trimco (TBM).

2.12 DOOR GASKETING

- A. Standard: BHMA A156.22
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior

applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- C. Replaceable Seal Strips Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- D. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- E. Manufacturers:
1. Hager Companies (HAG).
 2. National Guard Products (NGP).
 3. Pemko Manufacturing Co. (PEM).
 4. Zero International (ZRO).

2.13 THRESHOLDS

- A. Thresholds: ANSI/BHMA A156.21; fabricated to full width of opening indicated.
1. Manufacturers Subject to compliance with requirements, provide products by one of the following:
 - a. National Guard Products, Inc.
 - b. Reese Enterprises, Inc.
 - c. Zero International; Allegion plc.
 2. Except as otherwise indicated, provide standard threshold units of type, size, and profile as shown or indicated.
 3. Metal shall be extruded aluminum, 6063-T5 alloy.
 4. If possible, provide thresholds that are 1" wider than depth of frame except as otherwise noted.
- B. Thresholds at exterior doors and entrance systems:
1. Provide adjustable thresholds with integrated, gasketed thermal breaks.
 2. Provide finished dimension that is equal to width of adjacent framing system.

2.14 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: ANSI/BHMA A156.6; fabricated from **0.050-inch-** thick stainless steel; With manufacturer's standard machine or self-tapping screw fasteners.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ives.
 2. Fabricate protection plates not more than 2" less than door width on stop side.
 3. Protection plates shall be beveled on three edges.
 4. Furnish protection plates for concealed mounting where possible. Where exposed fasteners are used, they shall be countersunk.

2.15 AUXILIARY DOOR HARDWARE

A. Auxiliary Door Hardware: ANSI/BHMA A156.16.

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

- a. Burns
- b. Ives

B. Silencers:

1. Furnish tamper proof resilient cushions designed to absorb shock and noise at openings without gaskets.
2. Provide three (3) silencers per door.

C. Wall Bumpers:

1. 2-1/2" diameter, 1" nominal projection.

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and ANSI/BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended; however, aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.17 FINISHES

- A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series. For surface-applied door hardware, drill and tap doors and frames in accordance with ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.
- C. Door and Frame Preparation (ECU Housing Guideline)
 - 1. Before hardware installation, verify that all doors and frames are properly prepared to receive the specified hardware.
 - 2. Hollow metal frames shall be prepared for ANSI strike plates per A115.1-2 (4-7/8" high), hinge preps will be mortised and reinforced with a minimum of 10 gauge reinforcement material; minimum of 14 gauge reinforcement material for closer.
 - 3. Hollow metal doors shall be properly prepared and reinforced with a minimum of 16 gauge material for either mortised or cylindrical locks as specified. It is preferred that all hollow metal doors receiving door closers have 14 gauge reinforcement. If this is not possible, the use of sex bolts is mandatory.
 - 4. Wood doors shall be factory prepared to receive the scheduled hardware.

3.3 INSTALLATION OF DOOR HARDWARE

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750-mm-) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as directed by Owner.
 2. Furnish permanent cores to Owner for installation.
- E. Closers: When mounted to door face, shall be installed with through-bolts.
- F. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
1. Configuration: Provide one power supply for each door opening with electrified door hardware.
- G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- J. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- K. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant is to examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.7 DOOR HARDWARE SCHEDULE

- 1. See drawings.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Insulating glass.
 - 2. Glazing sealants.
 - 3. Miscellaneous glazing materials.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 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 temporary protection requirements for glazing during and after installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; **12 inches (300 mm)** square.
 - 1. Insulating glass.
- C. Glazing Accessory Samples: For sealants and colored spacers, in **12-inch (300-mm)** lengths. Install sealant Samples between two strips of material representative in color of adjoining framing system.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.
- B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD 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 are below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for 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 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 SOURCE LIMITATIONS

- A. Source Limitations for Glass: Obtain tinted glass from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source

from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations 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. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Glass product requirements are noted in the architectural drawings. Glass products to be Ultra Clear Low Iron. There shall be no green tint to the glass. As noted in the architectural drawings, provide physical samples for verification before submitting shop drawings.
- B. Fully Tempered Float Glass: ASTM C1048, 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.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard polyisobutylene and polyurethane primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction Polypropylene-covered stainless steel in color selected by Architect.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation
 - b. Sika Corporation
 - c. The Dow Chemical Company
 - d. Tremco Incorporated

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by 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:

1. EPDM with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:

1. EPDM with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 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.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 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-~~ (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 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 in writing 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 in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. 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.
 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces 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 08 80 00

SECTION 08 91 19 - FIXED LOUVERS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Fixed extruded-aluminum louvers.
2. Blank-off panels for louvers

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.**1.3 WARRANTY****A. Special Finish Warranty, Anodized Finishes:** Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, peeling, or chipping.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 FIXED EXTRUDED-ALUMINUM LOUVERS****A. Horizontal, Wind-Driven-Rain-Resistant Louver, Extruded Aluminum:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ruskin; Air Distribution Technologies, Inc.
 - b. Architectural Louvers Co.; Harray, LLC
 - c. Construction Specialties, Inc.
 - d. Greenheck Fan Corporation
 - e. Industrial Louvers Inc.
2. Louver Depth: 5 inches (127 mm).
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
4. Louver Performance Ratings:
 - a. Free Area: reference mechanical drawings and specifications.
 - b. Air Performance: Reference mechanical drawings and specifications.
 - c. Wind-Driven Rain Performance: Not less than 95 percent effectiveness when subjected to a rainfall rate of 8 inches (200 mm) per hour and a wind speed of 50 mph (22.4 m/s) at a core-area intake velocity of 500 fpm (2.5 m/s).
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, 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 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating

END OF SECTION 08 91 19

SECTION 09 67 23 - RESINOUS FLOORING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Resinous flooring.

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.**

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.3 ACTION SUBMITTALS**A. Product Data: For each type of product.**

1. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.**C. Samples for Verification: For each resinous flooring system required and for each color and texture specified, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.****D. Product Schedule: For resinous flooring.****1.4 INFORMATIONAL SUBMITTALS****A. Qualification Data: For Installer.****B. Material Certificates: For each resinous flooring component.****C. Material Test Reports: For each resinous flooring system.****1.5 CLOSEOUT SUBMITTALS****A. Maintenance Data: For resinous flooring to include in maintenance manuals.****1.6 QUALITY ASSURANCE****A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.**

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on 48-inch- (2400-mm-) square floor area selected by Architect.
 - a. Include 48-inch (2400-mm) length of integral cove base with inside and outside corner.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 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. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store liquid materials in unopened containers and protected from freezing.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.
- C. Close spaces to traffic during resinous flooring installation and for 24 hours after installation unless manufacturer recommends a longer period.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate installation of tile work with related work.
- B. Proceed with tile work only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.

1.10 WARRANTY

- A. The Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of 25 years. The manufacturer of resinous flooring system and other related installation materials shall provide a written twenty five (25) year warranty, which covers materials and labor.

1.11 MAINTENANCE

- A. Submit maintenance data under provisions of Section 01 73 00. Include cleaning methods, cleaning solutions recommended, stain removal methods, as well as polishes and waxes recommended.

1.12 EXTRA MATERIALS STOCK

- A. Upon completion of the work of this Section, deliver to the Owner 2% minimum additional material of each type and color used in the Work. Extra stock is to be from same production run or batch as original tile and installation materials.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Flammability: Self-extinguishing in accordance with ASTM D635.

2.2 RESINOUS FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor.
 - 1. Basis-of-Design: SoyStep Resin System.
 - 2. Alternate manufacturers: Stonehard, Sherwin Williams
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- C. System Characteristics:
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range.
 - 2. Wearing Surface: Textured for slip resistance.
 - 3. Overall System Thickness: **1/8 inch (3.2 mm)**.
- D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:
 - 1. Compressive Strength: 17,800 psi after 7 days minimum in accordance with ASTM C579.
 - 2. Adhesion Strength: ASTM-D-4541 >500 psi with 100% concrete failure.
 - 3. Tensile Strength: 7,100 psi after 7 days minimum in accordance with ASTM C307.
 - 4. Flexural Modulus of Elasticity: 10,000 psi after 7 days minimum in accordance with ASTM C580.
 - 5. Coefficient of Linear Expansion: 2.5×10^{-5} per ASTM D-696.
 - 6. Linear Shrinkage: ASTM C-531 <.02% Specifications for SoySTEP Flooring System
 - 7. Water Absorption: Less than two (2) percent per ASTM D-570.
 - 8. Indentation: Shall not exceed 1 percent maximum per ASTM D-2794 .
 - 9. Impact Resistance: No chipping, cracking, or delamination **1.6-mm** per MIL-D-24613 ASTM D-2794 >24,000 psi.
 - 10. Abrasion Resistance: MIL-D-24613, MIL-STD-1623 42 mg ASTM C-501 18mg .
 - 11. Temperature Resistance ASTM D-2794 150-200 F No visible softening, cracking or delaminating.
 - 12. Flame Spread MIL-D-24613, MIL-STD-1623 PASSED ASTM E-84 <3 Class A Flammability ASTM D-570

- Self Extinguishing Critical Rad Flux E-648 >1.07w/cm
13. Smoke Developed MIL-D-24613, MIL-STD-1623 PASSED Smoke Density ASTM E-662<3.
 14. Hardness: 14 days, Shore D in accordance with ASTM D2240.
 15. Critical Radiant Flux: E-648 >1.07w/cm².
 16. Odor ASTM D-2794 Free from objectionable odors.
 17. Weight ASTM D-2794 1.2 lbs/ft² @ 1/8" thickness.

- E. System Chemical Resistance: As per manufacturer's chemical resistance chart
- F. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- G. Waterproofing Membrane: Kerdi board system by Schluter, or equal by alternate manufacturer.
1. Waterproofing membrane shall be a complete system for sealing substrate, filling/bridging cracks/control joints, turn up cove base, etc, and shall be single sourced and provide a water proofing warranty for the system for 25 years.
 2. Compatibility letters shall be provided from both epoxy and waterproofing membrane manufacturers indicating the systems work together and will be warranted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resinous flooring systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare and clean substrates in accordance with resinous flooring manufacturer's written instructions for substrate indicated to ensure adhesion.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.
 2. Repair damaged and deteriorated concrete in accordance with resinous flooring manufacturer's written instructions.
 3. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in

installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** in 24 hours, or per manufacturer's recommendations, whichever is more stringent.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or manufacturer's recommendations, whichever is more stringent.
4. Alkalinity and Adhesion Testing: Perform tests recommended in writing by resinous flooring manufacturer. Proceed with installation only after substrate alkalinity is not less than **6** or more than **8** pH unless otherwise recommended in writing by flooring manufacturer,
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with manufacturer's written instructions.
1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring in accordance with manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials in accordance with resinous flooring manufacturer's written instructions.

3.3 INSTALLATION

- A. Apply components of resinous flooring system in accordance with manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.
1. Coordinate installation of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components in accordance with manufacturer's written instructions. Prevent contamination during installation and curing processes.
 3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Waterproofing Membrane: Apply waterproofing membrane where indicated on Drawings, in thickness recommended in writing by manufacturer.
- C. Field-Formed Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring coats. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
1. Integral Cove Base: **4 inches (100 mm)** high.
 2. Vertical Walls: Must integrate anti-sag according to Manufacturer's instruction.
- D. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness specified for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended in writing by manufacturer.
- E. Topcoats: Apply topcoats in number indicated for flooring system specified, at spreading rates recommended in writing by manufacturer, and to produce wearing surface specified.

3.4 FIELD QUALITY CONTROL

- A. Core Sampling: At Owner's direction and at locations designated by Owner, take one core sample per **1000 sq.**

ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

- B. Material Sampling: Owner may, at any time and any number of times during resinous flooring installation, require material samples for testing for compliance with requirements.

3.5 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

SECTION 09 91 00 - PAINTING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: Surface preparation of interior substrates and application of the following:
 - 1. Primers.
 - 2. Water-based finish coatings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include preparation requirements and application instructions.
 - 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) 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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that are from the same product run (batch mix) as materials applied and are packaged for storage and identified with labels describing contents and location where paint/color is applied.
 - 1. Paint Products: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied. All extra material quantities shall be rounded to the nearest whole gallon. No partial gallons shall be turned over.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

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

1. Behr Paint Company (Behr Process LLC)
2. Benjamin Moore & Co.
3. ICI Paints (Glidden Professional).
4. Sherwin-Williams Company (The).

B. Obtain each paint product from single source from single manufacturer.

2.2 INTERIOR PAINTS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system must 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, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

B. Colors: As indicated in a color schedule.

2.3 PRIMERS

A. Interior, Institutional Low-Odor/VOC Primer Sealer: Water-based primer sealer with low-odor characteristics and a VOC of less than 10 grams per liter for use on new interior plaster, concrete, and gypsum wallboard surfaces that are subsequently to be painted with latex finish coats.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Behr Paint Company (Behr Process LLC)
 - b. Benjamin Moore & Co.
 - c. Sherwin-Williams Company (The)
 - d. The Pittsburgh Paints Company

2.4 WATER-BASED FINISH COATINGS

A. Interior, Latex, Institutional Low-Odor/VOC Paint: Eggshell, White or colored latex coating with low-odor characteristics and a VOC of less than 10 grams per liter, for use in areas, such as hospitals and other occupied buildings, where the odor and VOC levels of conventional latex products would preclude their use.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Behr Paint Company (Behr Process LLC)
 - b. Benjamin Moore & Co.
 - c. Sherwin-Williams Company (The)
 - d. The Pittsburgh Paints Company

2. Gloss and Sheen Level: Manufacturer's standard satin.

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. Cementitious Composition Board: 12 percent.
 3. Masonry (Clay and CMU): 12 percent.
 4. Wood: 15 percent.
 5. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.
 6. Plaster: 12 percent. Verify that plaster is fully cured.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. 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. 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. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints to be painted exceeds that permitted in manufacturer's written instructions.

- F. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other loose foreign matter. Clean using methods recommended in writing by paint manufacturer.
 - 1. SSPC-SP 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7/NACE No. 4.
 - 4. SSPC-SP 11.
- G. 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.
- H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for interior use in paint system indicated.
 - 2. Sand surfaces that will be exposed to view and remove sanding dust.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Canvas and Cotton Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION OF INTERIOR PAINT PRODUCTS

- A. Apply paints in accordance with 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 the applicable interior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint 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.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 - 3. Allow empty paint cans to dry before disposal.
 - 4. Collect waste paint by type and deliver to recycling or collection facility.
- 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.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel and Iron Substrates:
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.1B:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.
- B. Galvanized-Metal Substrates:
 - 1. Latex System MPI EXT 5.3A:
 - a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.

3.6 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board and Plaster Substrates:
 - 1. Institutional Low-Odor/VOC Latex System :
 - a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, eggshell.
- B. CMU Substrates:
 - 1. Latex System MPI INT 4.2A:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.

C. Steel Substrates:

1. Latex System, Alkyd Primer MPI INT 5.1Q:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.
 - d. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

D. Galvanized-Metal Substrates:

1. Latex System MPI INT 5.3A:
 - a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.
 - d. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

END OF SECTION 09 91 00

SECTION 10 14 23.16 - ROOM-IDENTIFICATION PANEL SIGNAGE**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes room-identification panel signs.

1.2 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and largescale 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.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 - 3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
 - 2. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:
 - a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 2 inches by 6 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

1.3 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

1.4 FIELD 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

- 1. Manufacturers of Panel Signs:

- a. Andco Industries Corp.
 - b. ASI Sign Systems, Inc.
 - c. Best Sign Systems, Inc.
 - d. Mohawk Sign Systems.

2.2 SIGN MATERIALS

- A. Plastic Laminate: Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standards.

2.3 PANEL SIGNS

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

- 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

- B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

- 1. Edge Condition: Beveled cut.
 - 2. Edge Color: Edge color same as background.

- C. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

2.4 GENERAL FINISH REQUIREMENTS

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply. Both methods shall be used together to install signs.
 - 1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
 - 2. Mechanical Fasteners: Use nonremovable mechanical fasteners (T15 torque security screws) placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.2 ADJUSTING AND CLEANING

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.
- B. All signs to have raised tactile panel in accordance with Chapter 18 of the NC State Building Code, Volume I-C, Section 18.3.1.
- C. Install per typical mounting heights found on Sheet A4.00.

3.3 SIGN COPY SCHEDULE

- A. Contractor shall provide a minimum of two signs per door location, one sign for room number and one sign with text copy. Coordinate sign copy with Owner and Architect prior to fabrication.
- B. Contractor shall provide sign type combination as required at each door location. See sheet A8-1 for various sign type combinations. Contractor shall verify the locations for all signs and the required copy.

END OF SECTION 10 14 23.16

SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Solid-plastic toilet compartments.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for blocking.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Solid-plastic toilet compartments:
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

1.3 CLOSEOUT SUBMITTALS**A. Operation and Maintenance Data: For toilet compartments.****1.4 MAINTENANCE MATERIAL SUBMITTALS****A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.**

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.

5. Fasteners: 10 fasteners of each size and type.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

1.6 WARRANTY

- A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion
 1. Plastic Toilet Partitions: Against corrosion, breakage, and delamination: 15 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain plastic toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 75 or less.
 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

2.3 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ASI Accurate Partitions
 2. ASI Global Partitions
 3. Scranton Products
 4. Bradley Corporation.
- B. Color: selected from manufacturer's full range.
- C. Toilet-Enclosure Style: Overhead braced and.
- D. Urinal-Screen Style: Wall hung.
- E. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

G. All partitions and doors shall be 6'-2" tall A.F.F. All partitions and doors shall have a 9" under cut.

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty operating hardware and accessories.
1. Hinges: Manufacturer's minimum ~~0.062-inch-~~ (1.59-mm-) thick, stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
 2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit, designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.
 3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
 4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts. Full height of door.
 5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.
 6. Privacy Bracket full height of door to be provided on hinge side.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.
- D. Brackets between panels and to wall shall be full height of door for privacy screening.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: ~~ASTM B221~~ (ASTM B221M).
- C. Stainless Steel Sheet: ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- C. Door Size and Swings: Unless otherwise indicated, provide ~~24-inch-~~ (610-mm-) wide, inswinging doors for standard toilet enclosures and ~~36-inch-~~ (914-mm-) wide, outswinging doors with a minimum ~~32-inch-~~ (813-mm-) wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
1. Maximum Clearances:
 - a. Pilasters and Panels or Screens: ~~1/2 inch~~ (13 mm).
 - b. Panels or Screens and Walls: ~~1 inch~~ (25 mm).
 2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than ~~1-3/4 inches~~ (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.19

SECTION 10 26 00 - WALL AND DOOR PROTECTION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Stainless Steel Corner guards.
 - 2. Door Protection.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
 - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Corner Guards: **12 inches** long. Include example top caps. Shall be delivered to the Architect.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.4 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. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, **48-inch-** long units.

1.5 QUALITY ASSURANCE

- A. Cover materials shall be classified in accordance with ASTM E 84 as to flame spread and smoke development and shall be classified as self-extinguishing in accordance with ASTM D 635.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DOOR PROTECTION

- A. Stainless Steel Door Kick Plates: As manufactured by Rockwood, Wallguard, or Trudoor.
 - 1. Surface mounted kick plate fabricated from 16 gauge stainless steel, Type 304, with No. 4 satin finish. Min. 8" tall, width to match door width (inset 1/2" from edges).
 - 2. Provide at all interior doors.

2.2 WALL PROTECTION

- A. Stainless Steel Corner Guards: As manufactured by Wallguard, Construction Specialties, Inc., JLI Industries, Babcock-Davis, or approved equal.
 - 1. Surface mounted corner guards fabricated from 16 gauge stainless steel, Type 304, with No. 4 satin finish.
 - 2. 1.5" wide, by 48" tall. Corner guards to be provided at every outside gypsum board corner, and as noted on drawings.

2.3 MATERIALS

- A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- B. Adhesive: As recommended by protection product manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions where wall and door protection is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory

conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

3.3 CLEANING

- A. Immediately after completion of installation, exercising care to avoid damage to surfaces.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.
- C. Protect corner guards from damage until acceptance of work.

END OF SECTION 10 26 00

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Public-use washroom accessories.

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS**A. Product Data:** For each product.

1. Include construction details, material and finish descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Features that will be included for Project.
4. Manufacturer's warranty.

B. Samples: If requested, full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS**A. Sample Warranty:** For manufacturer's special warranties.**1.5 CLOSEOUT SUBMITTALS****A. Maintenance Data:** For toilet and bath accessories to include in maintenance manuals. For accessories to include in maintenance manuals.**1.6 WARRANTY****A. Manufacturer's Special Warranty for Mirrors:** Manufacturer agrees to repair or replace mirrors that fail in

materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Bobrick Washroom Equipment, Inc.
 2. Bradley Corporation.
 3. American Specialties, Inc.
- B. Toilet Tissue (Jumbo-Roll) Dispenser:
 1. Basis of Design Product: American Specialties 0046.
 2. Description: One-roll unit.
 3. Mounting: Surface mounted.
 4. Capacity: 13 1/2-inch diameter rolls.
 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 6. Lockset: Tumbler type.
 7. Refill Indicator: Pierced slots at front.
- C. Automatic Paper Towel (Roll) Dispenser:
 1. Basis of Design: Product American Specialties, Inc. 645224AC.
 2. Description: Towels are dispensed one at a time automatically when hands are placed in sensor zone until supply is depleted.
 3. Mounting: Recessed.
 4. Minimum Capacity: **8-inch-** wide, **800-foot-** long roll non-perforated roll.
 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 6. Lockset: Key lock.
- D. Soap Dispenser:
 1. Basis of Design: Bobrick B-2111.
 2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
 3. Mounting: Surface Mounted.
 4. Capacity: 40-fl oz.
 5. Materials: Stainless steel, No. 4 finish (satin)..
 6. Lockset: Tumbler type.
 7. Refill Indicator: Window type.
- E. Grab Bar:
 1. Basis of Design: Bobrick B-6806.
 2. Mounting: Flanges with concealed fasteners.
 3. Material: Stainless steel, **0.05 inch** thick.

- a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip

area.

4. OD: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

F. Mirror Unit:

1. Basis of Design: Bobrick B-290.
2. Frame: Stainless steel angle, 0.05 inch thick.
 - a. Corners: Welded and ground smooth.
3. Size: As indicated on Drawings.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

- G. Source Limitations: Obtain each type of private-use bathroom accessory from single source from single manufacturer.

2.3 MATERIALS

- A. Stainless Steel: ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- C. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET, BATH, AND LAUNDRY ACCESSORIES

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbs (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Fire-protection cabinets for the following:
 - a. Portable fire extinguisher.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.

1.2 PREINSTALLATION CONFERENCE**A. Preinstallation Conference: Conduct conference at Project site.**

1. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS**A. Product Data: For each type of product.**

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.**D. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches square.****E. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.****1.4 CLOSEOUT SUBMITTALS****A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.**

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 FIRE-PROTECTION CABINET

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Guardian Fire Equipment, Inc
 - 2. JL Industries; Activar Construction Products Group, Inc.
 - 3. Larsen's Manufacturing Company
- B. Fire-Protection Cabinet Type: Suitable for fire extinguisher.
- C. Cabinet Material: Aluminum sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
 - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Aluminum sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Tempered float glass (clear). Vinyl applied lettering indicating "FIRE EXTINGUISHER" in vertical orientation, letters as large as will fit full copy.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: White.
 - 4) Orientation: Vertical.
5. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by low voltage, complete with transformer.

K. Materials:

1. Aluminum: **ASTM B221** for extruded shapes and aluminum sheet, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet.
 - a. Finish: Baked enamel or powder coat.

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Miter corners and grind smooth.
 3. Provide factory-drilled mounting holes.
 4. Prepare doors and frames to receive locks.
 5. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum **1/2 inch** thick.
 2. Miter and weld perimeter door frames and grind smooth.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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 walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed and fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION OF FIRE-PROTECTION CABINETS

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at height indicated below:
 - 1. Fire-Protection Cabinet Mounting Height: 60 inches above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification:
 - 1. Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by

finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes portable, hand-carried fire extinguishers.
- B. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Final Acceptance.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ansul; brand of Johnson Controls International plc, Building Solutions North America
 - b. Guardian Fire Equipment, Inc
 - c. JL Industries; Activar Construction Products Group, Inc.
 - d. Larsen's Manufacturing Company
 - 2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
 - 3. Valves: Manufacturer's standard.
 - 4. Handles and Levers: Manufacturer's standard.
 - 5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container : UL-rated 4-A:60-B:C, **10-lb** nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10 44 16

DIVISION 10 73 00 - PREFABRICATED & PRE-ENGINEERED PROTECTIVE SHELTERS**PART 1 - GENERAL****1.01 DESCRIPTION OF PRODUCT – BLEACHER SHELTER**

- A. Shelter Type: 25' x 16' Mono Slope Bleacher Cover (reference drawings for shelter size and column spacing).
- B. Roof Slope: 1:12 (confirm this matches existing on park campus).
- C. Clear height under Tie Beam (UTB): 12'-0". This is the clearance under the tie beam which spans between the columns.
- D. Provide four in the locations indicated on architectural site plan.
- E. Refer to structural drawings for foundation and concrete slab-on-grade designs.

1.02 DESCRIPTION OF PRODUCT – DUG OUT SHELTER

- A. Shelter Type: 32' x 9' Mono Slope Dugout Cover. (reference drawings for shelter size and column spacing)
- B. Roof Slope: 2:12 (confirm this matches existing on park campus).
- C. Clear height under Tie Beam (UTB): 8'-0". This is the clearance under the tie beam which spans between the columns.
- D. Provide four in the locations indicated on architectural site plan.
- E. Refer to structural drawings for foundation and concrete slab-on-grade designs.

1.03 DESCRIPTION OF PRODUCT – PICNIC SHELTER

- A. Shelter Type: 30' Square Celestial Roof Hip shelter with Multi-Rib roof panels (reference drawings for shelter size and column spacing).
- B. Roof Slope: 6:12 (confirm this matches existing on park campus).
- C. Clear height under Tie Beam (UTB): 8'-0". This is the clearance under the tie beam which spans between the columns.
- D. Provide four in the locations indicated on architectural site plan.
- E. Refer to structural drawings for foundation and concrete slab-on-grade designs.

1.04 DESCRIPTION OF PRODUCT – SCORE KEEPERS SHELTER

- A. Shelter Type: 9' x 7' Mono Slope Score Keepers Cover. (reference drawings for shelter size and column spacing)
- B. Roof Slope: 2:12 (confirm this matches existing on park campus).
- C. Clear height under Tie Beam (UTB): 8'-0". This is the clearance under the tie beam which spans between the columns.
- D. Provide two in the locations indicated on architectural site plan.
- E. Refer to structural drawings for foundation and concrete slab-on-grade designs.

1.05 REFERENCES

- A. REFERENCED STANDARDS
 - 1. AISC – American Institute of Steel Construction
 - a. AISC Steel Construction Manual – 14th edition
 - b. AISC 360-10 Specification for Structural Steel Buildings
 - 2. ASTM – American Society for Testing and Materials
 - a. ASTM A36/A36M – Standard Specification for Carbon Structural Steel; 2008
 - b. ASTM A325 – Standard Specification for Structural Steel Bolts, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010

- c. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts; 2007a
- d. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a
- e. ASTM A653/A653M – Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot Dip Process; 2010
- f. ASTM A792/A792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process; 2010
- g. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 50 and 105 ksi Yield Strength; 2007a
- 3. AWS – American Welding Society
 - a. D1.1
 - b. D1.3
 - c. D1.8
- 4. OSHA – Occupational Safety and Health Administration
 - a. Steel Erection Standard 29 CFR 1926.750 Part R
- 5. SSPC – Steel Structures Painting Council
 - a. SSPC-SP 2 – Hand Tool Cleaning; 2004
 - b. SSPC-SP 10/NACE No. 2 – Near White Blast Cleaning; 2007
- 6. LEED – Leadership in Energy and Environmental Design
- 7. ISO – International Organization for Standardization

1.06 SYSTEM DESCRIPTION

- A. The structure shall be a pre-engineered package and shall be shipped as a pre-cut (excluding standing seam roof panels) and pre-fabricated package that shall include the structural framing members, roof panels, fasteners and roof trim as well as job specific installation instructions. The structure will be shipped in an unassembled package for ease of shipment and minimum shipping charges.

1.07 SUBMITTALS

- A. Submit a minimum of four (4) sets of submittal drawings and (2) sets of structural calculations signed and sealed by a Professional Engineer licensed in the state of NC.
- B. PRODUCT DESIGN REQUIREMENTS:
 - 1. The structure shall meet the following design requirements:
 - a. Building Code: North Carolina Building Code
 - b. Ground Snow Load: Refer to structural drawings.
 - c. Live Load: 20 p.s.f. (confirm with structural drawings)
 - d. Wind Speed: refer to structural drawings.
 - e. Seismic Design Category: refer to structural drawings.
- C. SUBMITTAL REQUIREMENTS
 - 1. Delegated Design Calculations:
 - a. Design according to the requirements of the national, state or local building codes as indicated in Section 1.04.B.
 - b. Calculations shall include all member design for each different member type.
 - c. Connection design for each different connection that will determine the design of the bolts, welds, plate thickness and anchorage to the foundation.
 - d. Foundation design shall be for the loads applied, not a generic foundation design, while taking into account all soils information.
 - e. Calculations to be signed and sealed by structural engineer, registered in the state of NC.
 - 2. Delegated Design Submittal Drawings:
 - a. Anchor bolt layout with all appropriate dimensions for installation.

- b. Site specific foundation design.
- c. Isometric as well as elevation and plan views of the framing members along with the member sizes and locations indicated on the drawings.
- d. Connection details for every connection on the frame.
- e. Roof panel connections and trim installation details.
- f. All accessories on the structure shall have an installation detail as well as connection details.
- g. Drawings to be signed and sealed by structural engineer, registered in the state of NC.

D. FOUNDATION DESIGN

- 1. The foundation design shall be coordinated with the manufacturer.
- 2. Anchor bolts shall be supplied by the manufacturer.
- 3. Foundation materials and labor shall be provided by the structure contractor.
- 4. Contractor should provide site specific soils information for proper foundation design, if that data is not provided the foundation will be design for the minimum soil values allowed by code.

1.08 QUALITY ASSURANCE

A. MANUFACTURER QUALIFICATIONS

- 1. The product shall be designed, engineered and fabricated at a facility operated and directly supervised by the manufacturer.
- 2. The manufacturer shall have a minimum of 15 years in steel shelter fabrication.
- 3. Full Time on Staff Quality Assurance Manager.
- 4. All welders must be AWS certified for welding steel structures.
- 5. Membership in the American Welding Society (AWS).
- 6. Membership in the American Institute of Steel Construction (AISC).
- 7. Full Time on Staff Licensed Engineer.
- 8. Published Quality Control System manual.
- 9. Quality Control System must pass an annual audit by a Third Part Agency.
- 10. ISO 9001 certification for Powder Coating System.

1.09 FIELD OR SITE CONDITIONS

- A. Foundations shall be coordinated with the prefabricated structure installation drawings.
 - 1. All foundations shall be cast at the same elevation unless specifically noted on the shop drawings.
- B. Anchor bolts shall be placed in the foundation as per the structure shop drawings utilizing the anchor bolt template supplied with the anchor bolts.
 - 1. Anchor bolts shall be installed per the dimensions and orientation shown on the drawings.

1.010 MANUFACTURER WARRANTY

- A. Shelter shall have a 10-year limited warranty on the steel framing members.
- B. Finish on steel shall have a 25 year warranty against peeling, flaking, and fading.

2.01 SHELTER SYSTEM AND MATERIALS

A. MANUFACTURERS:

1. Acceptable Manufacturer: ICON Shelter Systems, Inc., 1455 Lincoln Rd., Holland, MI, 49423. Email: info@iconshelters.com, Website: www.iconshelters.com.
 - a. Alternate manufacturers shall be considered if proven to be an equal. Submit substitution request for consideration.
 2. The product shall be designed and fabricated at a facility operated and directly supervised by the manufacturer.
- B. SUBSTITUTION LIMITATIONS:
1. Substitutions must be approved a minimum of ten (10) business days prior to bid. All approved manufacturers shall be notified on writing before the bid date and shall not be allowed to bid without written notification. Any approval of an alternate manufacturer shall be through and official bid addendum prior to the bid date.
 2. Alternate suppliers shall meet the requirements, qualifications and provide proof of certifications listed under Section 1.05 QUALITY ASSURANCE.
 3. Alternate suppliers shall provide documentation that the power-coat system being provided meets or exceeds the basis-of-design supplied powder-coat system listed under Section 2.01(c)(8).
- C. PRODUCT REQUIREMENTS AND MATERIALS:
1. GENERAL:
 - a. The pre-engineered and pre-fabricated package of parts shall be pre-cut and packaged unless noted otherwise. These packages will include all parts and pieces necessary to field assemble the shelter at the jobsite. The shelter shall be shipped in knocked down format to minimize shipping expenses. Field labor will be kept to a minimum with no on-site welding required.
 2. CONCRETE FOR FOUNDATIONS:
 - a. Concrete shall have a minimum 28-day compressive strength of 2,500 psi unless noted otherwise on the foundation detail.
 - b. Reinforcing steel shall be ASTM A615, Grade 60.
 3. COLUMNS:
 - a. Hollow Structural Section (HSS) columns shall meet ASTM A500, Grade B with a minimum wall thickness of 3/16" (0.1875").
 - b. Unless the columns are direct buried in the foundation the columns shall attach to the foundation with a minimum of four (4) anchor rods and shall meet OSHA Steel Erection Standard 29 CFR 1926.755(a)(1).
 4. STRUCTURAL FRAMING:
 - a. All Hollow Structural Sections (HSS) shall meet ASTM A500, Grade B. "I" Beams, tapered columns or open channel sections shall not be accepted for primary members.
 5. COMPRESSION RINGS:
 - a. Compression rings shall be made of ASTM A36 structural plate or of structural channel welded together to form the ring. All connections not requiring compression rings shall use ASTM A500, Grade B HSS sections for these connections.
 6. CONNECTION REQUIREMENTS:
 - a. Anchor rods shall be ASTM F1554, Grade 36 unless otherwise noted.
 - b. Structural fasteners shall be ASTM A325 high strength bolts and A563 nuts.
 - c. All structural fasteners shall be hidden within the framing members whenever possible.
 - d. No field welding shall be required to finish the construction of the shelter.
 - e. Manufacturer shall supply extra fasteners.
 7. ROOFING MATERIALS:
 - 1) Roof material shall be provided by contractor per Section 07 41 13.16 Standing Seam Metal Roof Panels to match existing roof panels on park campus.
 - 2) General contractor to determine if shelter subcontractor, or roofing contractor shall install roof panels to ensure warranty of both the structure and the roofing system is maintained.

8. FACTORY FRAME FINISH:
 - a. COASTAL FACTORY FRAME FINISH:
 - 1) All structural steel shall be cleaned, pre-treated and finished in the following manner:
 - 2) The steel shall be shot-blasted to the specification of SSPC-SP10 near white blast cleaning. SSPC-SP2 hand tool cleaning will not be an acceptable alternative.
 - 3) The shot-blasted parts are then washed with zinc-phosphate in an eight (8) stage washer.
 - 4) The steel is then immersed in a liquid epoxy and coated through an electro-deposition process (E-coat).
 - 5) The parts are then coated with two color coats of TGIC Super durable polyester powder of 8 to 12 mils.
9. ACCESSORIES
 - a. ELECTRICAL ACCESS
 - 1) Standard in all column bases is a 3" diameter hole, located in the center of the plate. This allows electrical wiring into the column base.
 - a)

PART 3 - EXECUTION

3.01 STORAGE AND HANDLING

- A. When the shelter arrives at the jobsite protect the products from weather, sunlight and damage.
- B. When unloading, pad the forks and use other precautions to protect the powder-coated finish. Do not use chains to move the materials, use straps. Handle all materials carefully in the field to avoid scratching the powder-coat finish.
- C. Contractor shall store the product elevated from the soil to allow full air circulation around the materials as do not introduce mold, decay, fungi or insects into or on the materials. One end of the materials shall be elevated higher than the other end if storage will be longer than a few days as to allow the water to run off the materials.

3.02 INSTALLATION OF MATERIALS

- A. The shelter shall be placed on prepared foundations that were designed by the manufacturer (unless otherwise noted). Materials for these foundations are not supplied by shelter manufacturer but by the foundation installation contractor. Foundation shall be constructed to all local building code requirements and per good construction practices for the specific site conditions.
 1. In accordance with OSHA Steel Erection Standard 29 CFR 1926.750 Part R, anchor rods shall be installed for proper column stability and shall have a minimum of four (4) anchor bolts per column. Therefore, no single anchor rod column base connections shall be allowed.
- B. The contractor shall install all parts and pieces per the manufacturer's supplied installation instructions and these specifications.
- C. The interface with other work required is to be coordinated by the customer or the customer's agent. Some design may have electrical or plumbing requirements that are not supplied by shelter manufacturer.
- D. Tolerances on structural steel members are set according to AISC Code of Standard Practice for Steel Buildings and Bridges and have been used for the fabrication of this product. These

tolerances will not and cannot be increased. No field slotting or opening of holes will be allowed without proper guidance from the shelter manufacturer engineer of record.

3.03 REPAIR

- A. No field modifications or corrections are allowed without authorization from the shelter manufacturer Engineer of record.

3.04 SITE QUALITY CONTROL

- A. shelter manufacturer does not require any on-site inspections or testing but these may be required by local authorities and the local building inspector. Please be aware of any on-site requirements prior to starting installation.

END OF SECTION

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SECTION 11 66 53.13 – BASEBALL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The work required under this section consists of furnishing all labor, materials, equipment, services, and related items necessary to supply and install Baseball Equipment, and all related work, to be complete, as indicated on the drawings and specified herein. This Section includes the following:
 - 1. Portable Mounds
 - 2. Bases
 - 3. Pitching Rubbers
 - 4. Batting Cages
 - 5. Batting Cage Nylon Turf
 - 6. Batting Cage Batting Mat

1.2 RELATED WORK

- 1. Examine Contract Documents for requirements that affect the work of this section. Other specification sections that directly relate to the work of this Section include, but are not limited to:
 - a. Division 31 – Earthwork; Excavation and Backfill and establishment of subgrade elevations.
 - b. Section 321313 – Concrete Pavement
 - c. Section 03300 – Cast-in-Place Concrete; Concrete foundations

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standard conflict with other specified requirements, the more restrictive requirements shall govern
 - 1. National Federation of State High School Associations (NFSHSA)
 - 2. National Collegiate Athletic Association (NCAA)
 - 3. International Amateur Athletic Foundation (IAAF)
 - 4. Manufacturers Data and Recommended Installation Requirements.

1.4 SUBMITTALS

- A. Manufacturers Product Data
 - 1. Provide manufacturer's product literature, technical specifications, and other data prior to actual field installation work for the Project Consultant or Owner's Representative review.

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B. Shop Drawings:

1. Provide drawings of manufacturers recommended installation and foundation requirements prior to actual field installation work for Engineer or Owner's Representative review.

1.5 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Materials delivered to the site shall be examined for concealed damage or defects in shipping. Any defects shall be noted and reported to the Owner's Representative.
- B. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule.
- C. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PORTABLE MOUNDS – **Contractor provided and installed.**

1. True Pitch Brand, # 202-6 (one per field).
 - a. Model: SKU: TPM-202-6
 - b. Color to be copper

B. BASES – **Contractor provided and installed.**

1. McGregor, Professional Bases
 - a. Model: SKU: 1055412
 - b. Must include anchors.
 - c. Refer to plans for quantity.
2. Macgregor Double First Base
 - a. Model: SKU: BBDFBSNR
 - b. Must include anchors.
 - c. Provide (1) set per field at first base

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C. PITCHING RUBBERS – **Contractor provided and installed.**

1. MacGregor, Rubber Pitchers Plate
 - a. Model: SKU: BBPPLATE
 - b. Must include anchors
 - c. Provide (3) set per field

D. BATTING CAGES – **Contractor provided and installed.**

1. Jaypro Sports, Mega Post & Cable Outdoor Batting Tunnel 55' Long Cage
 - a. Model: MPCTF-55W
 - b. Must include posts, netting, and fasteners.
 - c. Contractor shall provide concrete pad and footings in conformance with manufacturer specifications and project specifications.
 - d. Contractor shall surface batting tunnel and provide batting mat as specified in this section after concrete is installed and appropriately cured to the standards of these specifications.

E. BATTING CAGE NYLON TURF – **Contractor provided and installed.**

1. Jaypro Sports, Jaypro Batting Tunnel Turf – 30 Oz. Nylon Turf – 5mm Padded Backing
 - a. Model: #Turf30P
2. Jaypro Sports, Batting Mat
 - a. Model: BML612CL
 - b. Color: Red clay
 - c. Verify location of batting mat with Project Consultant & Owner prior to installation.
3. Contractor shall surface batting cages with the material specified above:
 - a. Concrete surface shall be thoroughly cleaned and at least 48 hours elapsed such that the surface is dry and free of any remnant chemical cleaners.
 - b. Allow sufficient time for turf to relax on flat surface per manufacturer recommendations such that material will not curl.
 - c. Apply turf adhesive and surf seam sealer per manufacturer specifications, including but not limited to type, grade, quantity, curing, and locations. Apply surf seam sealer along entire seams between turf sections during installation until pad has been completely surfaced.
 - d. Turn down nylon turf at edges of concrete pad.
 - e. After adhesive has been applied, roll material per manufacturer recommendation.
 - f. Allow material to cure for a minimum of 24 hours, or per manufacturer recommendation. The more restrictive requirement shall apply.

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PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Locate all baseball equipment where indicated on the drawings and attach as detailed on the drawings and as elaborated upon in the specifications and in conformance with manufacturer's recommendation
- B. Any item locations not specifically detailed in the Contract Documents shall be located at the direction of the Project Consultant.
- C. The trade performing the work of this section assumes full and sole responsibility for the accuracy and correctness of all layouts, lines, levels, grades, and other aspects of the work under this section. Layout all work in accordance with the requirements, therefore, as indicated in the drawings.
- D. Clean and touch-up paint all abraded, welded, and scratched surfaces with matching paint provided by each site furnishing manufacturer.

3.2 CLEANING:

- A. Perform cleaning during installation of the work and upon completion of the work.
- B. Remove from the project site any excess material and equipment at the completion of the work of this section.
- C. Repair any damage resulting from baseball equipment installation work.

END OF SECTION 11 66 53.13

SECTION 12 36 16 - METAL COUNTERTOPS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Stainless-steel countertops.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded wall-mounted shelves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For metal fabrications.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. For countertops, show locations and sizes of cutouts and holes for items installed in metal countertops.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products only after casework and supports on which they will be installed has been completed in installation areas.
- B. Keep finished surfaces of products covered with polyethylene film or other protective covering during handling and installation.

1.5 FIELD CONDITIONS

- A. Field Measurements: Where products are 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.
- B. Established Dimensions: Where products are indicated to fit to other construction, establish dimensions for areas where products are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL FABRICATIONS

- A. Countertops: Fabricate from **0.062-inch- (1.59-mm-)** thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of **1 inch (25 mm)** over the base cabinets.
 - 1. Joints: Fabricate countertops without field-made joints.
 - 2. Weld shop-made joints.
 - 3. Sound deaden the undersurface with heavy-build mastic coating.
 - 4. Extend the top down to provide a **1-inch- (25-mm-)** thick edge with a **1/2-inch (12.7-mm)** return flange.
 - 5. Form the backsplash coved to and integral with top surface, with a **1/2-inch- (12.7-mm-)** thick top edge and **1/2-inch (12.7-mm)** return flange.
 - 6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.

2.2 MATERIALS

- A. Stainless-Steel Sheet: ASTM A240/A240M, Type 304.
- B. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 "Joint Sealants" and the following:
 - 1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.3 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

- C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- D. Seal junctures of countertops, splashes, and walls with sealant for countertops.

3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces. Remove and replace damaged products or touch up and refinish damaged areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Final Acceptance.

END OF SECTION 12 36 16

**SECTION 230010
GENERAL PLUMBING REQUIREMENTS**

PART 1-GENERAL

1.01 GENERAL CONDITIONS:

The stipulations and conditions stated in this section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to all plumbing contract executed for construction of this project, or any part thereof.

The bid for the Plumbing Work is part of the General Contract.

1.02 GENERAL REQUIREMENTS:

The General Requirements hereinafter listed apply to the Plumbing Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.03 ALTERNATES:

Carefully examine all alternates at the back of this specification to determine if any work described under the Plumbing Section will be affected thereby.

1.04 INTENT:

The intent of Plumbing drawings and specifications are to describe the installation of a complete, fully adjusted, and operational Plumbing System. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Plumbing Contractor at his own expense.

1.05 DEFINITIONS:

The contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the Plumbing systems. All items of equipment are specified in the singular; however, the contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use."

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1.06 REQUIRED WORK DESCRIBED IN OTHER SECTIONS

Plumbing, General Requirements	230010
Plumbing Supports and Anchors	230140
Plumbing Piping Insulation	230260
Plumbing Piping	230410
Plumbing Specialties	230430
Plumbing Fixtures	230440
Plumbing Equipment	230450

1.07 VISIT TO THE SITE:

The Plumbing Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

1.08 REGULATORY REQUIREMENTS

All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. Plumbing Contractor shall notify the Engineer of such conflicts in writing prior to receipt of bids.

1.09 PERMITS AND FEES:

The Plumbing Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Plumbing Work Division of the specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the contractor under whose work such services appear. Before the job is certified as substantially complete, a certificate of approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

1.10 DRAWINGS AND SPECIFICATIONS:

The Plumbing Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No contractor shall take advantage of conflict or error between drawings and specifications, or between general drawings and mechanical, plumbing and/or electrical drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an addendum for this clarification, the contractor shall figure on the most expensive of the items in conflict.

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The Plumbing Contractor shall refer to the architectural and structural drawings and specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No contractor shall under any circumstances scale drawings for the location of equipment. Each contractor shall verify the locations of all utility services.

The Plumbing Contractor shall keep at least one set of corrected shop and design drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

1.11 SUPERVISION:

The Plumbing Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent for his respective contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

PART 2-PRODUCTS

2.01 STANDARD PRODUCTS:

Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.02 SUBMITTALS:

The Plumbing Contractor shall submit, for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the contractor has in his possession the approved shop drawing for the particular material or equipment. The contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.

Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name, and name of job.

Approval of equipment will not relieve the Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance

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with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Contractor and with no additional expense to the owner.

Required Shop Drawings are as Follows:

1. Lavatories and Trim
2. Plumbing Fixtures

2.03 SUBSTITUTIONS:

Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Contractor shall purchase and install all materials required.

All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

2.04 PRODUCT HANDLING:

Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

Each contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.05 MATERIALS AND WORKMANSHIP:

The Plumbing Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Contractor, at Plumbing Contractor's expense.

The Material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

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Any Plumbing equipment furnished by the Plumbing Contractor that is larger than those indicated on the drawings and described in these specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the Plumbing Contractor.

PART 3-EXECUTION

3.01 SCAFFOLDING, RIGGING, AND HOISTING:

The Plumbing Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.02 QUIET OPERATION AND VIBRATION:

All work shall operate under all conditions of load without any sound or vibration, which is objectionable in the opinion of the Engineer. Sound and vibration conditions considered objectionable shall be corrected at Plumbing contractors expense.

3.03 CUTTING AND PATCHING:

The Plumbing Contractor shall provide all cutting and patching necessary to install the work specified in this section. The patching shall match adjacent surfaces.

No structural member shall be cut without the approval of the engineer, and all such cutting shall be done in a manner directed by him.

3.04 EQUIPMENT SPACE AND ARRANGEMENT:

The Plumbing Equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.

The Plumbing Drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after award of the contract. No departure shall be made without written approval of the Architect/Engineer.

3.05 DAMAGE TO WORK ALREADY IN PLACE:

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The Plumbing Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

3.06 JURISDICTION OF WORK:

It may become necessary for the Plumbing Contractor to furnish labor or materials which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

3.07 COORDINATION WITH OTHER TRADES:

Plumbing work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate architectural, structural, mechanical, plumbing and electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Contractor shall make required changes or relocations at no additional cost to the Owner.

Installation, inspection, and testing of Plumbing work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination with Plumbing work.

The Plumbing Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the subcontractor or contractors directed to do this work.

3.08 DIVISION OF WORK:

This paragraph is intended to show exactly the point of division of work between the Electrical Work Division and the Plumbing Work Division.

All power requiring equipment covered in the Plumbing Division of the specifications shall be furnished, mounted, aligned and fused by the Electrical Contractor. All disconnect switches for this equipment shall be furnished in accordance with the Electrical plans.

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Throughout this paragraph the term wire, conduit and final connections shall include all pull boxes, junction boxes, splices, outlet boxes, mounting devices and other accessories required for a complete installation.

Electrical Equipment and wiring that is provided by the Plumbing Contractor shall be in accordance with the Electrical Specifications.

All individual motor starters and disconnects for mechanical equipment (fans, pumps, etc.) shall be furnished and installed under Division 15 inless indicated as a a part of a motor control center. Motor starters for mechanical equipment provided in motor control centers shall be furnished under Division16. Under Division 16, power wiring shall be provided up to a termination point consisting of a junction box, trough, starter, variable frequency drive, or disconnect switch. Under Division 16 line side terminations shall be provided. Wiring from the termination point to the plumbing equipment, including final connections, shall be provided under Division 15. The Plumbing Contractor shall be responsible for the proper direction of rotation for all three phase equipment. The Plumbing Contractor shall furnish and install all control circuitry.

3.09 EQUIPMENT INSTALLATION:

Final connections to equipment, including pipe, duct, and temperature controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.

Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these drawings and specifications.

3.10 OPERATION AND MAINTENANCE MANUALS:

- A. One complete manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.
- B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL," the name and location of the building, the name of the section, such as "Plumbing," or "Heating," and the name of the Contractor. Two copies of each approved manual shall be submitted to the Owner and one copy shall be submitted to the Architect-Engineer.
- C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the contract documents.
- D. Manuals shall include the following:

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- a. Complete operating installations, covering start-up and shutdown for all components installed.
- b. Legible copies of all shop drawings. Any comments incorporated in "as-noted" approvals of shop drawings shall be recorded on the drawings included in the manuals.
- c. All equipment maintenance and service manuals.
- d. A complete parts list for each piece of equipment.
- e. All descriptive literature for the equipment.
- f. Operating characteristics, performance data, ratings, and curves for each piece of equipment.
- g. Internal wiring and control diagrams.
- h. Automatic temperature control diagrams, part descriptions and numbers, and sequences of operation. Drawings shall be neatly folded and inserted in a separate clear plastic binder. The plastic binders shall be bound in the back of each manual.
- i. All other information pertinent to the maintenance and servicing of equipment and systems provided in the project.
- j. Name, address, and telephone number for service on each manufacturer's equipment.

3.11 OPERATING INSTRUCTIONS:

- A. After all equipment and services are in operation, and the operation and maintenance manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.'
- B. Instruction sessions shall be conducted during the owner's normal working periods, and at times and locations satisfactory to the Owner.

3.12 EQUIPMENT START-UP:

No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments required to meet design conditions. Such services shall be at no additional cost to the owner.

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3.13 GUARANTEE:

See General Conditions, Article 42 for guarantee requirements.

3.14 FINAL INSPECTION:

When the entire contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Plumbing Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the contract.

3.15 FINAL PAYMENTS:

All final payments are contingent upon all necessary certificates and/or approvals cited above, together with the written guarantee being presented to the Owner.

*****END OF SECTION*****

**SECTION 230140
SUPPORTS AND ANCHORS**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Pipe, hangers, supports, and associated anchors.
- B. Sleeves and seals.
- C. Flashing and sealing equipment and pipe stacks.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. Hanger for Pipes Sizes 1/2 to 4 Inches: Carbon steel, adjustable, clevis.
- B. Copper Pipe Support: carbon steel ring, adjustable, copper plated.
- C. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- D. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.02 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.03 FLASHING

- A. Metal Flashing: 26 gage galvanized steel.
- B. Lead Flashing: 5 lbs/sq feet sheet lead for waterproofing; one 1 lb/sq ft sheet lead for soundproofing.
- C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- D. Caps: Steel, 22 gage (0.08 mm) minimum; 16 gage (1.5 mm) at fire resistant elements

2.04 SLEEVES

- A. Sleeves for piping through non-fire rated floor: Form with Schedule 40 steel pipe.

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- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footing, and Potentially Wet Floors: Form with steel pipe.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Fire Stopping Insulation: Glass fiber type, noncombustible.

2.05 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulating wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper piping.

2.06 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

<u>PIPE SIZE DIAMETER</u>	<u>MAX. HANGER SPACING</u>	<u>HANGER</u>
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10' - 0"	3/8"
2-1/2 to 3 inch	10' - 0"	1/2"
4 to 6 inch	10' - 0"	5/8"
8 to 12 inch	12' - 0"	7/8"
C.I. Bell and Spigot (or No-Hub) and at joints	5' - 0"	3/8"

- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

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- C. Place a hanger within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical cast iron piping at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.

3.02 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- C. Seal floor and mop sink drains watertight to adjacent materials.

3.03 SLEEVES

- A. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- B. Install chrome plated steel or stainless steel escutcheons at finished surfaces.
- C. Provide wall penetration per attached UL system with the two attached details.

*****END OF SECTION*****

**SECTION 230260
PIPING INSULATION**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Piping insulation for plumbing piping.
- B. Jackets and accessories.

1.02 REFERENCES

- A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- B. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- C. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Owens Corning Fiberglass, Inc.
- B. Knauf, Inc.
- C. Certainteed, Inc.
- D. Substitutions: Under provisions of Section 15010.

2.02 INSULATION

- A. HOT AND COLD WATER
 - 1. 1" Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible.

2.03 JACKETS

- A. Interior Applications:
 - 1. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

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2. PVC Jackets: One piece, premolded type.

2.04 ACCESSORIES

- A. Insulation Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
- B. Insulating Cement: ANSI/ASTM C195; hydraulic setting
- C. Finishing Cement: ASTM C449.
- D. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install materials after piping has been tested and approved.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Insulate all piping above grade including within walls.
- C. Continue insulation through penetrations.
- D. In exposed piping, locate insulation and cover seams in least visible locations.
- E. Do not insulate unions at equipment, but bevel and seal ends of insulation at such locations.
- F. Neatly finish insulation at supports, protrusions, and interruptions.
- G. Jackets:
 1. Standard jackets with vapor barrier, factory-applied. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used.
 2. Interior above ground drain lines shall be included as above with PVC jackets.

*****END OF SECTION*****

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SECTION 230410 PLUMBING PIPING

PART I GENERAL

1.01 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer piping system.
- D. Domestic water piping system.

1.02 REFERENCES

- A. ANSI/ASME B16.3 Malleable Iron Threaded Fittings class 150 NS 300.
- B. ANSI/ASME B16.23 Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSISME Sec.9 Welding and Brazing Qualifications.
- D. ANSI/ASTM B32 - Solder Metal.
- E. ASME - Boiler and Pressure Vessel Code.
- F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- G. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- H. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- I. ASTM B88 - Seamless Copper Water Tube.
- J. ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- K. ASTM D2729 Poly (Vinyl Chloride) PVC Pipe and Fittings.

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1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code.
- C. Welders Certification: In accordance with ANSI/ASME Sec 9.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2729. Fittings: PVC. Joints: ASTM D2855 Solvent Weld.

2.02 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI/ASME B16.23, cast brass, ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.03 WATER PIPING BELOW GRADE

- A. Copper Tubing type K, annealed. Fittings: ANSI/ASME B16.29. Wrought copper. Joints: ANSI/ASTM B32, solder grade 95TA.
- B. Sanitary sewer piping below grade: vent piping
- C. Water piping shall be continuous with not joints.

2.04 UNIONS AND COUPLINGS

- A. 150 psig galvanized malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Dielectric Connections: Unions with galvanized or plated steel threaded end, copper threaded end, water impervious isolation barrier.

2.05 SANITARY SEWER PIPING (BELOW GRADE):

- A. PVC Pipe: ASTM D2729. Fittings: PVC. Joints: ASTM D2855 Solvent Weld.

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2.06 ACCEPTABLE MANUFACTURERS - VALVES

- A. Crane, Inc.
- B. Grinnell, Inc.
- C. Nibco, Inc.
- D. Substitutions: Under provisions of Section 230010.

2.07 GATE VALVES

- A. Non-Ferrous Systems: Bronze body, rising stem and handwheel, inside screw, single wedge or disc, threaded ends.
- B. Ferrous Systems: Iron body, bronze trim, rising stem and handwheel, inside screw single wedge, threaded ends.

2.08 BALL VALVES

- A. Up to 2 inches: (bronze) body stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
- B. Over 2 inches: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle flanged.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with unions.

3.02 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.

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- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- H. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- I. Trenching in accordance with Sections 230010.
- J. Backfill in accordance with Sections 230010.
- K. Install bell and spigot pipe with bell end upstream.
- L. Install valves with stems upright or horizontal, not inverted.

3.03 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.04 DISINFECT ION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, of 100 ppm of chlorine liquid.
- D. Bleed water from outlets to ensure distribution.

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- E. Maintain disinfectant in system for 2 hours.
- F. Flush disinfectant from system until residual equal to that of incoming water.

3.05 PRESSURE-TEST

- A. Provide pressure test for water and sewer piping. Provide results to Engineer.

Pressure test to consist of test on all or sections of the water supply with water or air pressure not less than 25 psi above the working pressure. A water test shall also be applied to the waste water system in its entirety or in sections. If the entire system is tested as a unit, the system shall be closed except the highest opening and the system filled with water to point of overflow. Water shall be kept in the system for at least 15 minutes prior to inspection. All testing shall conform to the N.C. building code plumbing Sections 107 – Inspections and Testing and Section 312 – Tests and Inspections.

*****END OF SECTION*****

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SECTION 230430 PLUMBING SPECIALTIES

PART I GENERAL

1.01 WORK INCLUDED

- A. Floor drains
- B. Cleanouts
- C. Water hammer arrestors

1.02 REFERENCES

- A. ANSI A112.21.1 - Floor Drains.
- B. ANSI A112.26.1 - Water Hammer Arrestors.
- C. PDI WH-201 Water Hammer Arrestors.

1.03 SUBMITTALS

- A. Submit Shop Drawings under Provisions of Section 230010.
- B. Submit shop drawings and product data that includes component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Josam, Inc.
- B. Jonespec, Inc.
- C. Zurn, Inc.
- D. Substitutions: Under provisions of Section 230010.

2.02 FLOOR DRAINS

- A. ANSI A112.21.1; 6" square lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

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2.03 CLEANOUTS

- A. Interior finished floor areas: Lacquered cast iron, two piece body and nickle - Bronze Round scoriated cover in service areas and round with depressed cover to accept floor finish in finished areas.
- B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.

2.04 ACCEPTABLE MANUFACTURERS - WATER HAMMER ARRESTORS

- A. Josam
- B. Zurn
- C. Jonespec
- D. Substitutions : Under provisions of Section 230010.

2.05 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

2.06 HOSE BIBS/HYDRANTS

- A. ANSI/ASSE 1019; non freeze, self draining type with polished bronze wall Plate lockable recessed box hose thread spout, removable key, and vacuum Breaker. (backflow preventer).
- B. Bronze or red brass, replacable hexagonal disc hose thread spigot, chrome plated

2.07 TRAP PRIMERS

- A. Trap Primer Valve: Josam 88250 or equal, valve shall be ½” all bronze with removable operating parts, integral vacuum breaker and gasketed access cover.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate cutting of floor construction to receive drains to required invert elevations.

3.02 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended

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performance.

- B. Extend cleanouts to finished floor. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install water hammer arrestors complete with accessible isolation valve.
- D. For exterior cleanouts, provide concrete pad completely surrounding the cleanout.

*****END OF SECTION*****

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SECTION 230440 PLUMBING FIXTURES PART I GENERAL

1.01 WORK INCLUDED

- A. Water Closets
- B. Lavatories
- C. Urinals
- D. Showers
- E. Eyewash

1.02 SUBMITTALS

- A. Submit product data that includes fixtures, sizes, roughin dimensions, utility sizes, trim, and finishes.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - FIXTURES & TRIM

- A. American Standard, Inc.
- B. Kohler, Inc.
- C. Eljer, Inc.
- D. Just, Inc.

2.02 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

- A. Church, Inc.
- B. Kohler, Inc.
- C. Olsonite, Inc.

2.03 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

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- A. Wade, Inc.
- B. Josam, Inc.
- C. Zurn, Inc.

2.04 WATER CLOSET (HANDICAPPED) (P-1)

- A. Bowl: ANSI A112.19.2; wall hung, siphon jet, vitreous china, closet bowl, with elongated rim, 1 ½" (28 mm) spud, china bolt caps.
- B. Flush Valve: ANSI A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker.
- C. Seat: (18" AFF) Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.05 WATER CLOSET (P-2)

- A. Bowl: ANSI A112.19.2; wall hung, siphon jet, vitreous china, closet bowl, with elongated rim, 1 ½" (28 mm) spud, china bolt caps. Provide with 3" trap.
- B. Exposed, quiet diaphragm type chrome plated flush valve with polished exterior. Provide with 6 VDC solenoid valve and battery powered automatic sensor with manual override push button. Include a brass electronics housing with polished chrome plated exterior, high back pressure vacuum breaker. Provide internal siphon guard protection, vandal, resistant stop cap.
- C. Seat: (15" AFF) Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.08 URINAL (P-3)

- A. Urinal: ANSI A112.19.2; vitreous china, wall hung siphon jet urinal with shields, integral trap, removable stainless strainer, 1 inch top studs, steel supporting hanger.
- B. Exposed, quiet diaphragm type chrome plated flush valve with polished exterior. Provide with 6 VDC solenoid valve and battery powered automatic sensor with manual override push button. Include a brass electronics housing with polished chrome plated exterior, high back pressure vacuum breaker. Provide internal siphon guard protection, vandal, resistant stop cap.

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- C. Wall Mounted Carriers: ANSI A112.6.1; cast iron and steel frame. To fit installation requirements.
- D. Mount at 24" to top of bowl rim.

2.11 ELECTRIC WATER COOLER (HIGH/LOW) (P-4)

- A. Fountain: ARI 1010; surface mounted electric water cooler with stainless steel top, baked enamel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, mounting bracket, refrigerated with integral air cooled condenser; capacity of 5 gal/min at 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degree F. Provide as two level wheel chair access model. Twin cabinets, wall mounted, loose key supply 17 GA cast brass P-Trap. Provide with filtered bottle water filling station.

2.10 LAVATORY (WALL HUNG - HANDICAPPED) (P-5)

- A. Basin: ANSI A112.19.4; porcelain enameled on cast iron wall hung lavatory with 20 x 18 inch minimum, with 4 inch high back drillings on 4 inch centers, rectangular basin with splash lip, front overflow and soap depression.
- B. Trim: ANSI A112.18.1; chrome plated combination supply fitting with open grid strainer, automatic water valve with 6 VDC sensor chrome plated housing, chrome plated 17 gage brass P-trap and arm with escutcheon.
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame. To fit installation requirements.

2.12 MOP SINK (P-6)

- A. 24" x 24" x 12" high with 6" drop front, rectangular, one piece precast terrazo, 1½" wide shoulders with stainless steel threshold. Drain body shall be stainless steel cast integral to basin.
- B. Trim: ANSI A112.18.1; exposed wall type supply with (cross) (lever) handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; 5 feet of ½" diameter plain end reinforced rubber hose, hose clamp, mop hanger
- A. Trim: ANSI A112.81.1; chrome plated brass supply with gooseneck swing spout, water economy aerator, wrist blade lever handles chrome plated 17 (1.2 mm) brass P-Trap and arm with escutcheon.

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2.14 SINK (KITCHEN HAND WASH (P-8))

- A. Bowl: ANSI A112.19.3; single compartment 17" x 15" outside, 13" inch deep dimension. Type 304 stainless steel, wall mounting, chrome brass drain. Provide splash-mounted 4" gooseneck faucet and built-in wrist handles.
- B. Trim: ANSI A112.18.1; chrome plated brass supply with gooseneck swing spout, water economy aerator, single lever handle chrome plated 17 gauge brass P-trap and arm with escutcheon.
- A. Provide keyhole style mounting bracket on the unit's rear. NSF Listed.
- B. Provide Advance Tabco 1097PS50 or equal.

2.15 THREE COMPARTMENT SINK (P-9)

- A. 16-gauge stainless steel with galvanized steel legs & adjustable plastic feet.
- B. 60" x 22-1/2" x 44-3/4". 12-inch bowl depth. 36-1/2" workspace.
- C. 1-1/2" drain outlets

PART 3 EXECUTION

3.01 INSPECTION

- A. Review shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.02 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with proper wall supports and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant.
- F. Mount fixtures to the following heights above finished floor:

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Water Closet:

Handicapped	18	inches to top of seat
Standard	15	inches to top of bowl rim
Childrens	10	inches to top of bowl rim

Urinals:

Handicapped	24	inches to top of bowl rim
Standard	17	inches to top of bowl rim

Lavatory:

Handicapped	34	inches to top of basin rim
Standard	34	inches to top of basin rim
Childrens	21	inches to top of basin rim

Drinking Fountain:

Two Level	40/34	inches to top of basin rim

3.03 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. At completion clean plumbing fixtures and equipment.
- C. Solidly attach water closets to floor with lag screws. Flashing is not intended to hold fixture in place.
- D. Provide escutcheon plates on pipe or wall fitting penetrations.
- E. Provide insulating covers on all exposed piping for lavatories.

*****END OF SECTION*****

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SECTION 230450 PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Water Heaters

1.02 SUBMITTALS

- A. Submit shop drawings and product data that includes dimension drawings of water heaters indicating components and connections to other equipment and piping.

1.03 WARRANTY

- A. Provide five year warranty.

PART 2 GENERAL

2.01 ACCEPTABLE MANUFACTURERS - WATER HEATERS

- A. State, Inc.
- B. A.O. Smith, Inc.
- C. Rheem, Inc.
- D. EEMAX

2.02 ELECTRIC WATER HEATER (WH-1)

- A. Water heater shall be rated at 4.5 kw, 230 volts, single phase, 60 cycle AC and listed by Underwriter's Laboratories.
- B. Heater shall have a minimum working pressure of 150 psi, nominal storage tank capacity of 40 gallons, with a separate 1" tapping for relief valve installation and a rigidly supported anode rod for maximum cathodic protection.
- C. Electric heating elements shall be zinc plated copper sheath, screw-in design. The control shall include a thermostat with high temperature cutoff. The jacket shall provide full size control compartment for performance of service maintenance through front panel opening and enclose the tank with foam insulation. Inlet/Outlet connections shall be located in the top for easy installation. Outer jacket shall be baked enamel finish.

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- D. Heater shall have a five year limited warranty.
- E. Furnish as A.O. Smith Model DEL-40 or equal by State, THEEM, or PVI..

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to UL requirements.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.

*****END OF SECTION*****

SECTION 230500 – MECHANICAL GENERAL REQUIREMENTS

PART 1-GENERAL

1.01 GENERAL CONDITIONS:

The stipulations and conditions stated in this section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to all mechanical contract executed for construction, of this project, or any part thereof.

The Mechanical work shall be part of the General Construction Contract.

1.02 GENERAL REQUIREMENTS:

The General Requirements hereinafter listed apply to the Mechanical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.03 ALTERNATES:

Carefully examine all alternates at the back of this specification to determine if any work described under the Mechanical Section will be affected thereby.

1.04 INTENT:

The intent of Mechanical drawings and specifications are to describe the installation of a complete, fully adjusted, and operational Mechanical System. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Mechanical Contractor at his own expense.

1.05 DEFINITIONS:

The contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, the contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use."

1.06 REQUIRED WORK DESCRIBED IN OTHER SECTIONS:

Mechanical, General Requirements 230500

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Mechanical Supports & Anchors	230501
Mechanical Identification	230502
Ductless Split System Heat Pump	230552
Power Ventilators	230870

1.07 VISIT TO THE SITE

The Mechanical Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

1.08 REGULATORY REQUIREMENTS

All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. Mechanical Contractor shall notify the architect or engineer of such conflicts in writing prior to receipt of bids.

1.09 PERMITS AND FEES:

The Mechanical Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Mechanical Work Division of the specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the contractor under whose work such services appear. Before the job is certified as substantially complete, a certificate of approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

1.10 DRAWINGS AND SPECIFICATIONS:

The Mechanical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No contractor shall take advantage of conflict or error between drawings and specifications, or between general drawings and mechanical, plumbing and/or electrical drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an addendum for this clarification, the contractor shall figure on the most expensive of the items in conflict.

The Mechanical Contractor shall refer to the architectural and structural drawings and specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No contractor shall under any circumstances scale drawings for the location of equipment. Each contractor shall verify the locations of all utility services.

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The Mechanical Contractor shall keep at least one set of corrected shop and design drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

1.11 SUPERVISION:

The Mechanical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent for his respective contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

PART 2 PRODUCTS

2.01 STANDARD PRODUCTS:

Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.02 SUBMITTALS:

The Mechanical Contractor shall submit for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the contractor has in his possession the approved shop drawing for the particular material or equipment. The contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.

Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name, and name of job.

Approval of equipment will not relieve the Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Contractor and with no additional expense to the owner.

Required Shop Drawings are as follows:

1. Condensor
2. Mini splits

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3. Power ventilators

2.03 SUBSTITUTIONS:

Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Contractor shall purchase and install all materials required.

All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

2.04 PRODUCT HANDLING:

Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and, protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the owner.

Each contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.05 MATERIALS AND WORKMANSHIP:

The Mechanical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Contractor at Mechanical Contractor's expense.

The Material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

Any mechanical equipment furnished by the Mechanical Contractor that is larger than those indicated on the drawings and described in these specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit,

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circuit breakers, switches, etc. or for changes in work already installed shall be borne by the Mechanical Contractor.

PART 3 EXECUTION

3.01 SCAFFOLDING, RIGGING, AND HOISTING:

The Mechanical contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.02 QUIET OPERATION AND VIBRATION:

All work shall operate under all conditions of load without any sound or vibration, which is objectionable in the opinion of the Engineer. Sound and vibration conditions considered objectionable shall be corrected at mechanical contractors expense.

3.03 CUTTING AND PATCHING:

The Mechanical Contractor shall provide all cutting and patching necessary to install the work specified in this section. The patching shall match adjacent surfaces.

No structural member shall be cut without the approval of the engineer, and all such cutting shall be done in a manner directed by him.

3.04 EQUIPMENT SPACE AND ARRANGEMENT:

The Mechanical Equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.

The Mechanical Drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after award of the contract. No departure shall be made without written approval of the Architect/Engineer.

3.05 DAMAGE TO WORK ALREADY IN PLACE:

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The Mechanical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

3.06 JURISDICTION OF WORK:

It may become necessary for the Mechanical Contractor to furnish labor or materials, which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

3.07 COORDINATION WITH OTHER TRADES:

Mechanical work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate architectural, structural, mechanical, plumbing and electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Contractor shall make required changes or relocations at no additional cost to the owner.

Installation, inspection, and testing of Mechanical work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination with Mechanical work.

The Mechanical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the subcontractor or contractors directed to do this work.

3.08 DIVISION OF WORK:

This paragraph is intended to show exactly the point of division of work between the Electrical Work Division and the Mechanical Work Division.

All power requiring equipment covered in the Mechanical Division of the specifications shall be furnished, mounted, aligned and fused by the Mechanical Contractor. All disconnect switches for this equipment shall be furnished by the Mechanical Contractor.

The Electrical Contractor shall provide the conduit, wire and final connections to the line side of the disconnect.

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Throughout this paragraph the term wire, conduit and final connections shall include all pull boxes, junction boxes, splices, outlet boxes, mounting devices and other accessories required for a complete installation.

Electrical Equipment and wiring that is provided by the Mechanical Contractor shall be in accordance with the Electrical Specifications.

Under Division 16, power wiring shall be provided to a termination point consisting of a junction box, trough, starter, or disconnect switch. Under Division 16, line side terminations shall be provided. Wiring from the termination point to the mechanical equipment, including final connections, shall be provided under Division 15.

3.09 EQUIPMENT INSTALLATION:

Final connections to equipment, including pipe, duct, and temperature controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.

Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these drawings and specifications.

3.10 OPERATION AND MAINTENANCE MANUALS:

- A. One complete manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.
- B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL," the name and location of the building, the name of the section, such as "Plumbing," or "Heating," and the name of the Contractor. Two copies of each approved manual shall be submitted to the Owner and one copy shall be submitted to the Architect-Engineer.
- C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the contract documents.
- D. Manuals shall include the following:
 - a. Complete operating installations, covering start-up and shutdown for all components installed.
 - b. Legible copies of all shop drawings. Any comments incorporated in "as-noted" approvals of shop drawings shall be recorded on the drawings included in the manuals.

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- c. All equipment maintenance and service manuals.
- d. A complete parts list for each piece of equipment.
- e. All descriptive literature for the equipment.
- f. Operating characteristics, performance data, ratings, and curves for each piece of equipment such as condensers, fans, and air handling units.
- g. Final testing and balancing reports.
- h. All other information pertinent to the maintenance and servicing of equipment and systems provided in the project.
- k. Name, address, and telephone number for service on each manufacturer's equipment.

3.11 OPERATING INSTRUCTIONS:

- A. After all equipment and services are in operation, and the operation and maintenance manuals are available, an instruction and training session shall be conducted for the owner's operating personnel.
- B. Instruction sessions shall be conducted during the owner's normal working periods, and at times and locations satisfactory to-the Owner.

3.12 EQUIPMENT START-UP:

No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments required to meet design conditions. Such services shall be at no additional cost to the Owner.

3.13 GUARANTEE:

The Mechanical Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

Any defective work, equipment, material and/or workmanship that develops within the guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Contractor without cost to the Owner.

3.14 FINAL INSPECTION:

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When the entire contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Mechanical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the contract.

3.15 FINAL PAYMENTS:

All final payments are contingent upon all necessary certificates and/or approvals cited above, together with the written guarantee being presented to the Owner.

*****END OF SECTION*****

**SECTION 230501 –
MECHANICAL SUPPORTS AND ANCHORS**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Pipe hangers, supports, and associated anchors.
- B. Sleeves and seals.

1.02 SUBMITTALS

- A. Submit shop drawings and product data under provisions 15500.
- B. Indicate hanger and support framing and attachment methods.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 o 1-1/2 Inch stainless steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 and over: stainless steel, adjustable, clevis.
- C. Shield for Insulated Piping: 18 gage stainless steel shield over insulation in 180 degree segments, minimum 16 inches long at pipe support.

2.02 HANGER RODS

- A. Stainless Steel Hanger Rods: Threaded both ends, or continuous threaded.

2.03 INSERTS

- A. Inserts: Malleable iron case of galvanized] steel shell and expander plug for threaded connection; size inserts to suit threaded hanger rods.

2.04 FABRICATION

- A. Design hangers without disengagement of supported pipe.

2.05 FINISH

- A. Prime and finish coat exposed steel hangers and supports.

PART 3 EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>MAX. HANGER SPACING</u>	<u>HANGER DIAMETER</u>
1/2 to 2 1/2 inch	10' – 0"	3/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support vertical piping at every floor.

F. Support riser piping independently of connected horizontal piping.

3.02 INSERTS

A. Drill hole in concrete of sufficient size that the expansion case can be inserted.

B. Provide wall penetration per attached UL system detail.

*****END OF SECTION*****

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SECTION 230502 MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Identification of mechanical products installed under Division 15.

1.02 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Seton Name Plate Corp.
- B. W. H. Brady Co.
- C. Substitutions: Under provisions of Section 15500.

2.02 MATERIALS

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

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3.02 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners.
- B. Plastic Tags: Install with corrosive-resistant chain.
- C. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- D. Equipment: Identify chiller, pumps, air cooled condenser, tanks and water treatment devices with plastic nameplates.
- E. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- F. Valves: Identify valves in main and branch piping with tags.
- G. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, - and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

*****END OF SECTION*****

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SECTION 230508 – PIPE INSULATION

PART 1 GENERAL

WORK INCLUDED

- A. Piping insulation.
- B. Jackets and accessories.

PART 2 PRODUCTS

ACCEPTABLE MANUFACTURERS

- A. Owens-Corning Fiberglass, Inc.
- B. Knauf, Inc.
- C. Certainteed, Inc.
- D. Substitutions: Under provisions of Section 230500.

2.01 INSULATION

- A. Type A: Pre-molded Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible.
- B. Type B: Cellular foam; flexible, plastic; 'k' value of 0.28 at 75 degrees F.

2.02 JACKETS

- A. Vapor barrier jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
- B. PVC Jackets: One piece, premolded type.
- C. Aluminum Jackets: ASTM B209; 0.020 inch thick; smooth finish.

2.03 ACCESSORIES

- A. Insulation Bands: 3/4 inch wide; 0.007 inch thick aluminum.
- B. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

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- C. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
- D. Finishing Cement: ASTM C449.
- E. Fibrous Glass Cloth: Untreated; 9 oz/sq yd weight.
- F. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install materials after piping has been tested and approved.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Continue insulation through penetrations.
- C. In exposed piping, locate insulation and cover seams in least visible locations.
- D. Do not insulate unions at equipment, but bevel and seal ends of insulation at such locations.
- E. Neatly finish insulation at supports, protrusions, and interruptions.
- F. Jackets:
 - 1. Standard jackets with vapor barrier, factory-applied. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used.
 - 2. Exterior refrigerant piping shall be Type B with PVC sleeve jacket.
 - 2. Interior above ground drain lines shall be included as above with PVC jackets.
- G. Provide speed channel line set cover over all refrigerant piping.

*****END OF SECTION*****

**SECTION 230510 –
HYDRONIC PIPING**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Flexible connections.
- D. Chilled water system.

1.02 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.9.

1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ANSI/ASME SEC 9.
- C. Welders Certification: In accordance with ANSI/ASME SEC 9.

1.04 SUBMITTALS

- A. Submit product data that includes data on pipe materials, pipe fittings, valves, and accessories.

PART 2 PRODUCTS

2.01 EQUIPMENT DRAINS AND OVERFLOWS

- A. Type L Copper pipe ASTM B88
 - 1. Fittings: ANSI/ASME B16.23, cast brass or ANSI/ASME B16.29, wrought copper.

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PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe,
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. After completion, fill, clean, and treat systems.

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Provide clearance for installation of insulation, and access to valves and fittings.
- F. Provide access where valves and fittings are not exposed.
- G. Slope piping and arrange system to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Prepare pipe, fittings, supports, and accessories for finish painting.

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3.03 APPLICATION

- A. Install condensate piping to drain to exterior
- B. Provide splash block at exterior for draining.
- C. Insulate condensate drain

*****END OF SECTION*****

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SECTION 230530 REFRIGERANT PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Refrigerant Piping System.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING, ABOVE GRADE

- A. Copper tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ASW A5.8, Bcup silver bronze or flared.

2.02 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe size 2 inches and under: 150 psig malleable iron unions for threaded ferrous piping; bronze union for copper pipe, soldered joints.

2.03 ACCEPTABLE MANUFACTURERS VALVES

- A. ITT Grinnell, Inc.
- B. Carnes, Inc.
- C. Nibco, Inc.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel -plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with unions.

3.02 INSTALLATION

- A. Route piping in orderly manner and maintain gradient.
- B. Install piping to conserve building space and not interfere with use of space.

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- C. Install piping to allow for expansions and contraction without stressing pipe, joints or connected equipment.
- D. Where pipe support members are welded to structural building frame, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- E. Prepare pipe, fittings, supports and accessories not prefinished, ready for finish painting.

3.03 SERVICE CONNECTIONS

- A. Connect to new condensing units and new furnace DX coils.
- B. Provide suction and liquid lines from heat pump condensing units to air handling units in Concessions room.

*****END OF SECTION*****

**SECTION 230535
REFRIGERATION SPECIALTIES**

PART I GENERAL

1.01 WORK INCLUDED

- A. Liquid indicators
- B. Refrigerant driers
- C. Filter driers
- D. Solenoid valves
- E. Expansion valves
- F. Refrigerant charging valves
- G. Flexible connections

1.02 REFERENCES

- A. Safety Code for Mechanical Refrigerant, ANSI B9.1
- B. Refrigerant Piping, ANSI B31.5
- C. National Plumbing Code, ASME A40.8
- D. Refrigerant Liquid Receivers, ARI 495
- E. Liquid Line Driers, ARI 710
- F. Thermostatic Refrigerant Expansion valves, ARI 750
- G. Seamless Copper Tube, ASTM 88

1.03 REGULATORY REQUIREMENTS

- A. Comply with applicable regulations and mechanical refrigeration codes.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 230500.
- B. Submit manufacturer's installation instructions under provisions of Section 230500.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Sporlan
- B. Henry Valve Co.
- C. Parker Hannifin Corp.

2.02 LIQUID INDICATORS

- A. Double port type with copper or brass body, and flared or solder ends.
- B. Provide removable seal caps on each port for inspection of refrigerant condition.
- C. Provide full size liquid indicators in main liquid line leaving condenser.

2.03 FILTER DRIERS

- A. Angle type, with brass shell and using combined straining and drying material.
- B. Employ replaceable desiccant material
- C. Acceptable in lieu of separate strainers and driers
- D. Provide three valve by pass assembly

2.04 SOLENOID VALVES

- A. Copper or brass body with flared or threaded ends.
- B. Use replaceable coil assembly
- C. Provide a manually operated stem to permit operation in case of coil failure.
- D. Provide solenoid valves in liquid line of systems operating with single pump out or pump down compressor control, in liquid line of single evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

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2.05 EXPANSION VALVES

- A. Angle type or straight through design suitable for the refrigerant utilized in the system.
- B. Brass body, internal or external equalizer, and adjustable superheat setting, complete with capillary tube and remote sensing bulb.
- C. Size expansion valves to avoid being undersized at full load and excessively oversized at partial load.
- D. Evaluate refrigerant pressure drop through system to determine the available pressure drop across each valve.
- E. Select valves for maximum load at design operating pressure and minimum 43 degrees F.(6 degrees C) of superheat.

2.06 CHARGING VALVES

- A. General purpose type with brass body, flared or solder ends, and removable valve core.
- B. Provide valve inlet with quick coupling connection for ease of charging.
- C. Provide refrigerant charging connections in liquid line between receiver shut-off valve and expansion valve.

2.07 FLEXIBLE CONNECTORS

- A. Close pitch corrugated bronze hose with single layer of exterior braiding.
- B. At least 9 inches long with bronze fittings.
- C. Utilize only at or near compressors where it is not physically possible to absorb vibration within piping configuration.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.

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3.02 FILTER DRIERS

- A. Install with bypass assembly to permit isolation for servicing.

3.03 EXPANSION VALVES

- A. Locate expansion valve sensing bulb immediately after evaporator outlet on suction line.

*****END OF SECTION*****

**SECTION 230552
DUCTLESS SPLIT SYSTEM HEAT PUMP UNTIS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Split unit.
- B. Unit controls.

1.02 SUBMITTALS

- A. Submit shop drawings and product data for manufactured products and assemblies required for this project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Daikin Manufacturing Company
- B. Mitsubishi Manufacturing Company
- C. Sanyo Manufacturing Company

2.02 EQUIPMENT (Indoor Unit-Typical of two)

- A. General:

Indoor, direct-expansion, wall-mounted fan coil. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral wall-mounting bracket, mounting hardware, and thermistor interconnection cable.

- B. Unit Cabinet:

Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal and acoustic performance.

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C. Fans:

1. Fan shall be tangential direct-drive blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic, motor-driven vertical air sweep shall be provided standard.
2. Air sweep operation shall be user selectable. Horizontal direction may be manually adjusted (using remote controller) and vertical air sweep may be manually set.

D. Coil:

Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header.

E. Motors:

Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

F. Controls:

Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 64 F to 84 F. The unit shall have the following functions as a minimum:

1. An automatic restart after power failure at the same operating conditions as at failure.
2. A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
3. Temperature-sensing controls shall sense return-air temperature. Indoor-air high discharge temperature shutdown shall be provided.
4. Indoor coil freeze protection.
5. Wireless infrared remote control to enter set points and operating conditions.
6. Auto Stop features shall have integral setback control.
7. Automatic airsweep control to provide on or off activation of airsweep louvers.
8. Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
9. Fan-only operation to provide room air circulation when no cooling is required.

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10. Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit and at the remote controller.
11. An indoor to outdoor thermistor connection cable shall be provided with the fan coil unit.
12. Fan speed control shall be user-selectable: high, medium, low, or microprocessor automatic operation during all operating modes.
13. A time delay shall prevent compressor restart in less than 3 minutes.
14. Automatic heating-to-cooling changeover to provide automatic heating and cooling operation. Control shall include deadband to prevent rapid mode cycling.
15. Demand defrost shall be provided and shall minimize defrost cycles by internally adjusting defrost timing based on frost accumulation.
16. Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.
17. Provide wireless thermostat in clear lockable plastic perforated cover.

G. Filters:

Unit shall have filter track with factory-supplied cleanable filters.

H. Electrical Requirements:

Unit shall operate on 230v ,single phase, 60 Hz power supply as specified on the equipment schedule. Power and control connections shall have terminal block connections.

I. Operating Characteristics:

1. The unit shall be matched with an outdoor unit. The combination of the outdoor unit and the indoor-fan coil unit shall have a total net cooling capacity of 12,000 Btuh or greater at conditions and entering-air temperature at the evaporator coil of 80 degrees F dry bulb and 67 degrees F wet bulb. Outdoor ambient temperature of air entering the condenser of 95 degrees F.
2. The system shall have a minimum listed SEER (seasonal energy efficiency ratio) of 12 at ARI conditions.
4. The heating capacity shall be 12,000 Btuh or greater.

J. Refrigerant Lines:

All units shall have rotatable refrigerant lines for penetration through the wall using flare connections. All units shall have flare connections.

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- K. Provide field installed condensate pump to completely remove condensate from the drain pan. The pump shall consist of two parts: an internal reservoir/sensor assembly, and a remote sound shielded pump assembly. The lift capability shall be 1 to 10 feet. A level sensor on the condensate pan shall stop cooling operation if the level in the condensate pan is unacceptable.

2.03 EQUIPMENT (Outdoor Unit - Typical of one)

A. General:

Factory assembled, single piece, air-cooled outdoor unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, full charge of R-410A refrigerant, and special features required prior to field start-up. Unit shall operate two indoor units

B. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized-steel, bonderized and coated with a baked-enamel finish.
2. Unit access panels shall be removable with minimal screws and shall provide full access to the compressor, fan, and control components.
3. Outdoor compartment shall be isolated and have an acoustic lining to assure quiet operation.

C. Fans:

1. Outdoor fans shall be direct-drive propeller type, and shall discharge air horizontally. Fans shall blow air through the outdoor coil (38HDC only).
2. Outdoor fan motors shall be totally-enclosed, single-phase motors with class B insulation and permanently-lubricated sleeve bearings. Motor shall be protected by internal thermal overload protection.
3. Shaft shall have inherent corrosion resistance.
4. Fan blades shall be corrosion resistant and shall be statically and dynamically balanced.
5. Outdoor fan openings shall be equipped with PVC coated protection grille over fan and coil.

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D. Compressor:

1. Compressor shall be fully hermetic reciprocating or scroll type.
2. Compressor shall be equipped with oil system, operating oil charge, and motor. Internal overloads shall protect the compressor from overtemperature and overcurrent. Scroll compressors shall also have high discharge gas temperature protection if required.
3. Motor shall be NEMA rated class F, suitable for operation in a refrigerant atmosphere.
4. Reciprocating compressors shall be equipped with crankcase heaters to minimize liquid refrigerant accumulation in compressor during shutdown and to prevent refrigerant dilution of oil.
6. Compressor assembly shall be installed on rubber vibration isolators and shall have internal spring isolation.
7. Compressor shall be single-phase or 3-phase as specified on the contract drawings.

E. Outdoor Coil:

Coil shall be constructed of aluminum fins mechanically bonded to internally enhanced, seamless copper tubes which are cleaned, dehydrated, and sealed.

F. Refrigeration Components:

Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps, accumulator, pressure relief, and a full charge of refrigerant.

G. Controls and Safeties:

Operating controls and safeties shall be factory selected, assembled, and tested. The minimum control functions shall include the following:

1. Controls:
 - a. Time delay restart to prevent compressor reverse rotation on single-phase scroll compressors.
 - b. Automatic restart on power failure.
 - c. Safety lockout if any outdoor unit safety is open.

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- d. A time delay control sequence provided through the fan coil board, thermostat, or controller.
 - e. High-pressure and liquid line low-pressure switches.
 - f. Automatic outdoor-fan motor protection.
 - g. Start capacitor and relay (single-phase units without scroll compressors).
2. Safeties:
- a. System diagnostics.
 - b. Compressor motor current and temperature overload protection.
 - c. High pressure relief.
 - d. Outdoor fan failure protection.

H. Electrical Requirements:

- 1. All other units shall operate on single-phase, 60 cycle power at 208v.
- 2. Unit electrical power shall be a single point connection.
- 3. Unit control voltage to the indoor-fan coil shall be 24 v.
- 4. All power and control wiring must be installed per NEC and all local building codes.
- 5. High- and low-voltage terminal block connections.

I. Special Features – Provide the Following:

- *1. Low-Ambient Kit:
Control shall regulate fan-motor cycles in response to saturated condensing pressure of the unit. The control shall be capable of maintaining a condensing temperature of 100 F $\pm$ 10 F with outdoor temperatures to –20 F. Installation of kit shall not require changing the outdoor-fan motor.
- *2. Liquid Solenoid Valve:
This electronically operated shutoff valve shall close and open in response to compressor operation. The valve should be used with all long-lines applications (over 100 ft).
- *3. Winter Start Control:
Field supplied and installed winter start control shall be provided for cooling operation under low-load conditions and at low-ambient temperatures by bypassing the low-pressure switch for a 3-minute delay period. Winter start control shall be provided for this unit. Unit shall be shipped with a clamp-on compressor oil sump heater.

*****END OF SECTION*****

SECTION 230870 – POWER VENTILATORS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Ceiling exhaust fans.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Penn, Inc.
- B. Acme, Inc.
- C. Greenheck, Inc.
- D. Substitutions: Under provisions of Section 230500.

2.02 ROOFTOP EXHAUST FAN (Direct Drive)

- A. Centrifugal sidewall exhaust fan: Fabricated steel, fabricated aluminum, or cast aluminum blades and hubs. Blades shall be securely attached to fan shaft. Statically and dynamically balanced.
- B. Motors: Permanently lubricated, heavy duty type.
- C. Fan Shafts: Ground and polished steel. Mount in permanently lubricated sealed ball bearing pillow blocks.
- D. Provide with motor guard, wall housing, motor operated backdraft damper, and actuator.
- E. Provide one point wiring connection.
- F. Provide roof curb per drawings.

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PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions .

*****END OF SECTION****

**SECTION 230952
CONTROLS AND INSTRUMENTATION**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Electric Control System
- B. Control Devices, Components, Wiring, and Materials
- C. Instructions to Owners

1.02 SUBMITTALS

- A. Submit shop drawings and product data showing system drawings, wiring diagrams, and written detailed operational description. All products to include UL listing.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Honeywell, Inc.
- B. Carrier Inc.
- C. Trane, Inc.
- D. Substitutions: under provision of section 230500.

2.02 CONTROL SYSTEMS

- A. Provide electric control products in sizes and capacities indicated, consisting of switches, relays, and other components as required for a complete installation. Except as otherwise indicated, provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer. Provide electric control systems with following functional and construction features as indicated.
- B. Provide materials and field work necessary to connect control components, factory supplied, as part of equipment controlled.

2.03 MINI SPLIT THERMOSTAT

- A. Factory wired fully programmable with setback, low voltage, adjustable to control compressor and condenser fan, supply fan, and to maintain temperature setting.

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- B. Include system selector switch (heat-off-cool), fan control (auto-on) switch, and indicator light.
- C. Locate thermostat in rooms as shown.
- D. Provide vandal resistant locking cover.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate thermostats 48 inches above floor to top per ADA .
- B. Install systems and materials in accordance with manufacturer's instruction, rough-in drawings, and detail drawings.
- C. Number-code and color-code all connectors.
- D. Provide for a complete service of control systems, including call-backs, for one year running concurrent with connection period.
- E. All electrical work shall be in accordance with the latest Edition of the National Electric Code.
- F. All 120 volt control wiring shall be a minimum of #14 THHN.
- G. All control wiring shall be enclosed in EMT conduit inside and rigid galvanized conduit outside.

3.02 ADJUSTING AND CLEANING

- A. Start-up: Start-up, test, and adjust electric control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Clean factory finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch up paint.
- C. After completion of installation, adjust thermostats, control valves, motors, and similar equipment provided as worked in this section.
- D. At completion of installation, provide instruction for operating personnel.

*****END OF SECTION*****

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SECTION 260100 – GENERAL ELECTRICAL REQUIREMENTS

The Electrical Contractor must organize his work and secure material in a manner that will expedite the project thus completing the project on schedule. Conditions of the Contract, Form of Construction Contract, Notice to Bidders, Supplementary General Conditions, General Specifications and all of which are a part of these specifications.

The electrical work shall be part of the general contract.

The Contractor shall refer to the Notice to Bidders, Instructions to Bidders and General Conditions of the Contract, Form of Construction Contract, Supplementary General Conditions, General Specifications and all Division 260000 Electrical Specifications all of which are a part of these specifications.

Refer to drawings for exact dimensions and layout.

PART 1 GENERAL

1.01 These specifications and the accompanying plans are intended to describe the installation of a complete electrical system in this building complex. The work to be done under these specifications shall include the furnishing of all labor, equipment and materials required to provide a complete and working electrical system as shown on the plans and as outlined in these specifications.

PART 2 GENERAL

2.01 The contract shall include all labor, materials, permits, etc. necessary for the completion of the work. All materials, shall be new except as specifically noted, and shall have Underwriter's Laboratory approval or U.L. re-examination listing, and shall be installed in accordance with the best practice by experienced mechanics.

2.02 The electrical plans are diagrammatic only and are not intended to show all details of the work. The location of all conduit work is approximate and the Electrical Contractor shall make any necessary changes in the location to avoid piers, beams, footings, plumbing, duct and other obstructions at no additional cost to the owner.

2.03 The spirit as well as the letter of the plans and specifications work shall be executed according to the true intent and meaning of plans and specifications, both of which are intended to include everything requisite for a complete electrical system.

2.04 The Electrical Contractor shall comply with all state and Underwriter's requirements, ordinances or rules governing work of the character including the current edition of the National Electrical Code and OSHA and all applicable local codes.

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2.05 Should any error or omission exist in either or both of these plans and specifications, or conflict one with the other, the Contractor shall not avail himself of such unintentional error, omission or conflict, but shall have same explained and adjusted before signing the contract or proceeding with the work, otherwise, he shall at his expense supply the proper materials

and labor to make good any damage to or defect in his work caused by such error, omission or conflict.

PART 3 SAMPLES

3.01 All materials, equipment and accessories entering into the work area are subject to the approval or disapproval of the Engineer. No samples are required to be submitted with bid documents. Name of equipment suppliers shall be provided on the Bid Form where required.

3.02 The samples required by the Engineer shall be submitted after the award of the contract and acceptance of the Contractor's bond. All samples shall be delivered to a location designated by the Engineer.

3.03 No inspection or test shall be made except upon formal notice to the Engineer from the Contractor by letter or telegram. Contractor shall furnish all labor and appliances for tests and shall meet all expenses of said test.

3.04 In all cases where devices or part of the equipment is herein referred to in the singular number, it is intended that such referred shall apply to as many devices as are required to complete the installation.

PART 4 SPECIAL CONDITIONS

4.01 Everything necessary for the completion and successful operation of the work, whether or not here definitely specified or indicated on the drawings, shall be furnished and installed as well and faithfully as if so indicated and specified.

4.02 Contractor shall store all materials in trailers each night. No materials shall be left in the institution.

4.03 System voltage shall be the following:

277/480 VAC, three phase, 4 wire, Wye, 60 hertz

PART 5 PAINTING

5.01 All factory finished metal surfaces damaged during installation shall be restored to their original condition.

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PART 6 SUPERVISION AND SUPERINTENDENCE

6.01 This Contractor shall during the progress of the work, maintain a competent superintendent who shall not be changed except if he proves unsatisfactory to the Contractor or the Engineer.

PART 7 WORKMANSHIP

7.01 Only the finest quality workmanship shall be acceptable and any shoddy work shall be removed without delay and such materials shall not be re-used without the consent of the Engineer.

7.02 The Electrical Contractor's foreman shall be thoroughly experienced in the installation of electric wiring as covered by the plans and specifications and he shall remain on the job continually while the work is in progress. His qualifications, and ability shall be acceptable to the Engineer.

PART 8 INSPECTION AND TESTS

8.01 The system shall be installed in strict accordance with the regulations of the local and State Codes and ordinances.

8.02 The final inspection and tests shall be made only after the Engineer shall be satisfied that the work described in these specifications has been completely installed in accordance with the spirit and intent of these specifications. The acceptance of the work shall not in any way prejudice the rights to demand the replacement of defective materials or workmanship. The Electrical Contractor shall furnish instruments, special apparatus, and expert service to make all necessary tests to show that the system is absolutely clear of improper grounds and short circuits and to demonstrate that the entire equipment as to capacity, quality, and completeness is properly installed to meet all requirements of these specifications and defects shall be remedied without delay. Electrical Certificate shall be by the State Electrical Inspector. It is the responsibility of the electrical contractor to notify the Office of the State Electrical Inspector to schedule required inspections.

PART 9 VISIT TO SITE

9.01 All bidders shall visit the site and thoroughly familiarize themselves with the existing conditions before submitting their bids. No allowances will be made for a lack of knowledge of existing conditions.

PART 10 GUARANTEES

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10.01 The contractor shall deliver the systems to the owner in first class operating condition in every respect and shall guarantee as specified in Instructions To Bidders and General Conditions of the Contract for one full year after final acceptance of the project

PART 11 LIQUIDATED DAMAGES

11.01 Refer to General Conditions

PART 12 COORDINATION

12.01 The electrical contractor shall be responsible for any delays in construction caused by the Electrical Contractor.

PART 13 FEES AND PERMITS

13.01 Contractor shall acquire and pay for all fees and permits required by authorities.

PART 14 CONTRACTOR DEFINED

14.01 The words "Contractor", "contractor" and "Electrical Contractor" are used in this section are synonymous.

PART 15 ACCEPTANCE

15.01 The entire electrical construction will be accepted as a unit. There will be no partial acceptance.

PART 16 DAMAGES

16.01 This contractor shall be responsible for damage to the work of others or the property and any damage by this contractor shall be repaired or replaced by this contractor at no cost to the owner.

PART 17 RECORD DRAWINGS

17.01 The contractor shall furnish to the Engineer drawings of any arrangements installed differently from those shown on the Engineer's contract drawings.

PART 18 SUBSTITUTE MATERIALS

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- 18.01 A 10 day prior approval before the bid date shall be required for any substitutions than the materials listed in the specifications.

PART 19 ELECTRICAL TESTING

19.01 FEEDER INSULATION RESISTANCE TESTING

1. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. The procedures listed below shall be followed:
 - a. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conductors and between conductor and the grounding conductor.
 - b. 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 the grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
 - c. At final inspection, the contractor shall furnish a megger and show the engineers and State Construction Office representatives that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.

19.02 GROUND SYSTEM TESTING

1. Upon completion of installation of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. When tests show resistance-to-ground is over 25 ohms, appropriate action should be taken to reduce the resistance to 25 ohms, or less, by driving additional ground rods. (The compliance should be demonstrated by retesting).

19.03 GROUND FAULT PROTECTION SYSTEM

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1. The ground fault protection on new circuit breakers shall be performance tested in the field and properly calibrated and set in accordance with the coordination study.

19.04 DOCUMENTATION

1. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
2. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

*****END OF SECTION*****

SECTION 260111 - CONDUIT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Electrical Metallic Tubing and Fittings
- B. Non Metallic Conduit and Fittings
- C. Rigid Metal Conduit and Fittings

1.02 REFERENCES

- A. ANSI C80.3 Electrical Metallic Tubing, zinc coated
- B. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and cable assemblies.
- C. FS WW-C-581 - Specifications for Galvanized Rigid Conduit

PART 2 PRODUCTS

2.01 EMT

- A. EMT: ANSI C80.3 galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel only hexagonal threaded connectors unless specified otherwise. Indenter fittings will not be allowed.
- C. ACCEPTABLE MANUFACTURERS
 - 1. National
 - 2. Republic
 - 3. Spang

2.02 RIGID STEEL CONDUIT:

- A. Rigid steel conduit: ANSI C80:1; FS WW C 581. Conduits shall be rigid steel hot dipped galvanized zinc, metallized, sherradized mild steel, Schedule 40 size, threaded, manufactured in accordance with Underwriter's Laboratory standard and so labeled.

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B. ACCEPTABLE MANUFACTURERS:

1. National
2. Republic
3. Spang
4. Or Equal

C. Fittings and Conduit Bodies: ANSI/NEMA FB1; threaded style.

2.03 PLASTIC CONDUITS AND FITTINGS:

- A. Conduit NEMA TC2: 40 PVC manufactured in accordance with Underwriter's Laboratory Standard and UL listed.**
- B. Fittings and conduit bodies TC3.**
- C. Acceptable Manufacturers:**
1. Allied
 2. Carbon
 3. FRE Conduit

2.04 FLEXIBLE METALLIC CONDUIT AND FITTINGS

- A. Conduit FS-WW-C-566 (Galvanized Steel)**
- B. Fittings and conduit bodies: ANSI (NEMA FB)**

2.05 CONDUIT SUPPORTS

- A. Conduit clamps, straps, and supports: malleable iron for riser assemblies.**

2.06 METALLIC CONDUIT AND FITTINGS

- A. Conduit FS-WW-566 (Galvanized Steel)**
- B. Fitting and conduit bodies**
- C. Acceptable Manufacturers**

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1. Alflex Corp.
2. Allied
3. Thomas and Betts

PART 3 EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORTS

- A. Size conduit for conductor type installed. 3/4" (20mm) minimum size.
- B. Arrange conduit to present a neat appearance.
- C. Route exposed conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6" clearance between conduit and piping. Maintain 12" (300mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Paralleled conduit shall be run straight and true with offsets uniform and symmetrical. Conduit terminals, boxes and cabinets shall be rigidly secured with double locknuts, one inside and one outside and bushings. Insulated bushings of the plastic type shall be used on all conduits 3/4" trade size and larger. Lacquer coating of conduits shall be removed where ground clamps are to be installed.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Exposed conduit shall be securely fastened in place in accordance with the latest issue of the NEC. Horizontal and vertical conduit runs may be supported by one-hole malleable straps, clampbacks or other approved device with suitable bolts, expansion shields where needed or beam clamps for mounting to building structure or special brackets. Adjustable hangers may be used to suspend conduits when separately located. The required strength of the supporting equipment shall be based on the combined weight of conduits, hangers and cables.

3.02 CONDUIT INSTALLATIONS ABOVE GRADE

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.

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- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of four 90-degree bends between boxes.
- E. Use conduit bodies to make sharp changes in direction.
- F. Use hydraulic one shot conduit bender or factory elbows for bends in conduit larger than 2" (50 mm) size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listing fire rating equal to wall or floor rating.
- K. Route exposed surface metal raceway to provide least obvious installation. Utilize corners of rooms as much as possible.
- L. Conduit couplings for CRC and PVC shall be in accordance with NEC.
- M. EMT couplings shall be of the plated steel hexagonal compression type. No POT METAL or INDENTED type couplings shall be utilized.
- N. EMT couplings shall be "concrete tight" where buried in masonry or concrete. Where installed in damp locations fittings shall be of the "raintight" type.

3.03 UNDERGROUND CONDUIT INSTALLTION – BELOW GRADE

- A. Underground installation shall conform to ANSI C2 and NFPA 70 except as otherwise specified or indicated.
- B. Direct Burial System: Branch circuit conduit shall be buried directly in earth. Trenches in which conduits are placed shall be excavated by hand or with mechanical trenching equipment. Provide a minimum conduit depth to bottom of trench of 30" for power conductors operated less than 600 volts. Trenches shall not be less than 6"

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wide, and shall be in straight lines between cable markers. Cable plows shall not be used. Bends in trenches shall have a radius of not less than 36". Where two or more conduits are laid in parallel in the same trench, they shall be spaced laterally at least 3" apart. When rock is encountered, it shall be removed to a depth of at least 3" below the cable and the space filled with sand or clean earth free from particles larger than 1/4". Provide a plastic warning tape as specified herein. Conduits exposed to physical damage shall be encased in 3" of concrete including service entrance conduits and telecommunications conduits.

- C. Conduits crossing other metal piping shall be separated from the other pipe by not less than 12" of well tampered earth.
- D. The top of the duct shall not be less than 30" below grade, shall have a minimum slope of 3" in each 100 feet away from buildings and toward other necessary drainage points, and shall run in straight lines except where a change of direction is necessary. As each conduit run is completed, a testing, mandrel not less than 12" long with a diameter of 1/4" less than the inside diameter of the duct shall be drawn through each conduit; after which a brush, having stiff bristles, shall be drawn through until the conduit is clear of all particles of earth, sand, or gravel; conduit plugs shall then immediately be installed. There shall not be less than 3" clearance from the conduit to each side of the trench. The bottom of the trenches shall be graded smooth; where rock, soft spots, or sharp edged materials are encountered, excavate the bottom for an additional 3"
- E. Warning Tapes in Earth Trenches: For the purpose of early warning and identification during future trenching or other excavation, continuous identification tapes shall be provided in the trench above direct buried cables. Tape shall be nonmagnetic plastic tape or aluminum foil plastic-backed tape manufactured for the purpose of early warning and identification of utilities buried below the tape. Tape shall be at least 3" in width. Color of tape shall be standard with the manufacturer for the type of utility buried below the tape. Tape shall not have lettering at least 1" high with not less than the following identification of the tape: "BURIED ELECTRIC LINE BELOW". Tape shall be installed according to the printed recommendations of the tape manufacturer as modified herein. Tapes shall be buried at a depth of 6" below the top surface of earth: in pavements, this 6" shall be measured from the top of the subgrade.
- F. Terminate conduits in end bells where duct lines enter handholes.
- G. Reconditioning of Surfaces:

Unpaved surfaces disturbed during the installation of duct or dirt burial cable shall be restored to their original elevation and condition. Sod or topsoil shall be preserved carefully and replaced after the backfilling is completed. Sod that is damaged shall be replaced by sod of quantity equal to that removed. Where the surface is disturbed a

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newly seeded area, the restored surface shall be reseeded with the same quality and formula of seed as that used in the original seeding. Compaction shall be in 6" layers.

- H. Surfaces to be paved shall be restored and soil replaced to meet all requirements for paved road preparation as detailed in the Civil Engineering Specifications including backfill to 95% compaction.

- I. Cable Pulling: Cables shall be pulled down grade with the feed-in point at the point of the highest elevation. Flexible cable feeds shall be used to convey cables through the opening and into the duct runs. Cable lubricants shall be soapstone, graphite, or talc for rubber or plastic jacketed cables. Cable pulling tensions shall not exceed the maximum pulling tension recommended by the cable manufacturer. If basket-grip type cable pulling devices are used to pull cable in place, cut off the section of the cable under the grip before splicing and terminating.

3.04 SCHEDULE OF CONDUIT INSTALLATION

- A. Interior concealed installation: Electrical metallic tubing for all conduit less than and including 2 1/2". Rigid galvanized steel conduit shall be used for all conduit larger than 2 1/2". EMT shall not be installed where:
 - 1. It will be subject to severe physical damage.
 - 2. It will be subject to severe corrosive influence.
 - 3. Tubing, elbows, couplings, and fittings would be in concrete or in direct contact with the earth.
 - 4. It is protecting the service entrance conductors.

- B. Rigid conduit shall be used where subject to severe physical damage. Use rigid galvanized steel conduits for any exterior exposed conduit installation.

- C. Use EMT and flexible metallic conduit for interior lighting in the building as designated.

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*****END OF SECTION*****

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SECTION 260120 - WIRE AND CABLE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Building Wire
- B. Cable
- C. Wiring connections and terminations

1.02 REFERENCES

- A. NEMA WC-5 thermoplastic insulated wire and cable for the transmission and distribution of Electrical Energy

1.03 SUBMITTALS

- A. None

PART 2 PRODUCTS

2.01 BUILDING WIRE

- A. Thermoplastic insulated Building Wire - NEMA WC 5
- B. Branch circuit 10 AWG and Smaller copper solid conductor, 600 volt insulation, THHN/THWN.
- C. Branch circuit -conductors #8 AWG and larger shall be stranded copper conductor 600 volt insulation THHN/THWN. All insulation for #6 and #8 AWG shall be color coded by pigmentation, not tape.
- D. Minimum conductor size for all power and lighting circuits shall be #12 AWG.
- E. All conductors #12 AWG and larger shall be colored by pigmentation (not tape).

2.02 CONDUCTORS

- A. All conductors shall be tinned soft or annealed copper wire of the quality manufactured in accordance with ASTM specifications. Cutting away of strands to permit inserting into lugs will not be tolerated.

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- B. Conductor sizes shall be American Wire gauge sizes as indicated and stranded construction. All wires to be factory marked with stamping every two feet indicating size, type, voltage, rating and manufacturer's name. Wire shall be factory color-coded. Color coding shall be as follows: 230/120 Volt: Leg A-Black, Leg B-Red, Neutral-White, and Ground-Green. The system-grounding conductor shall be colored green. The system-grounding conductor shall be colored green. Note the green coding required by NEC for conductors intended solely for the grounding purposed. In multi-conductors, the group shall be color coded. All color-coding shall be by pigmentation. Surface colored wires will not be accepted.

2.03 ACCEPTABLE MANUFACTURERS

- A. Phelps Dodge
- B. Houston
- C. Southwire

PART 3 EXECUTION

3.01 GENERAL WIRING:

- A. Use no wire smaller than 12 AWG for power and lighting circuits. For 20 ampere single phase branch circuits longer than 75 feet, use #10 AWG.
- B. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- C. Splice only in junction or outlet boxes..
- D. Neatly train and lace wiring inside boxes, equipment and panelboards.
- E. Each feeder conductor in pull box or panel containing more than one home run shall be identified by non-magnetic metal tag. Tags shall be one inch in diameter and have stamped numbers and letters 1/2" high. Tape with printed numbers, etc., type identifiers shall be acceptable for temporary use during construction. Thoroughly wipe wire and cable with alcohol to clean surface before applying tape identifiers.

3.02 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricants for pulling 4 AWG and larger wires.
- B. Install wire in raceway after all mechanical work likely to injure conductors has been completed.

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- C. As far as practicable, all feeder cables shall be continuous from origin to panel termination without running splices in intermediate pull boxes or splicing chambers. Sufficient slack shall be left at the termination to make proper connections. Unless otherwise noted, each conduit raceway shall contain only those conductors constituting a single feeder circuit. All cable terminals, taps and splices shall be made secure with solderless pressure type connectors unless otherwise specified. Where conductors are to be connected to metallic surfaces, the coated surfaces for the metal shall be polished before installing the connector. Marlin twine shall be used to bind cable groups together.
- D. Completely and thoroughly swab raceway system before installing conductors.

3.03 CABLE INSTALLATION

- A. Use suitable cable fittings and connectors.

3.04 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes, outlets, troughs or handholes if necessary, avoid splicing if possible.
- B. Joints in solid conductors shall be spliced using Ideal “wirenuts”, 3M Company “Scotchlock” or T&B “Piggy” connectors in junction boxes, outlet boxes and lighting fixtures.
 - 1. “Sta-kon” or other permanent type crimp connectors shall not be used for branch circuit connections.
 - 2. Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with U/L approved insulating covers, may be used instead of mechanical connectors plus tape.
 - 3. Conductors, in all cases, shall be continuous from outlet to outlet and no splicing shall be made except within outlet or junction boxes, troughs, and gutters.
- B. Use compression connectors for copper wire splices and taps 8 AWG and larger. All joints splices and taps and other sections of wiring requiring taping shall be taped with at least two layers of approved gum rubber tape which shall be laid on with half lap followed by at least one layer of friction or plastic tape laid on with half lap. The intent of this specification is that the taping shall be neatly done and form a permanently secured insulation equal to 150 percent of the insulation value of the conductor.
- C. Thoroughly clean wires before installing lugs and connectors.

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- D. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.
- E. Terminate spare conductors with wire nut connectors.

3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing shall be performed.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Torque test conductor connections and terminations to manufacturer's recommended value.
- D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

- A. Interior Locations: Building wire in raceways.

*****END OF SECTION*****

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SECTION 260130 – BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Wall and ceiling outlet boxes
- B. Pulling and junction boxes

1.02 RELATED WORK

- A. Section 16141 General Purpose Wiring Devices

1.03 REFERENCES

- A. ANSI/NFHA OS 1 Metal outlet boxes, device boxes, covers and box supports
- B. UL Standard 886
- C. FED. SPEC. W-C-583B

PART 2 PRODUCTS

2.01 OUTLET BOXES

- A. Sheet metal outlet boxes: ANSI/ NEMA OS 1; galvanized steel with 1/2 inch (13mm) male fixture studs where required. Boxes shall be at least 2-1/2" deep and of sufficient size to accommodate devices noted. Boxes for fixtures shall have mounting lugs or ears for covers. Wall switch outlet boxes shall be set as indicated above finished floor. Where located near doors, they shall be installed on the lock side of the door.
- B. Cast boxes: cast ferroalloy, deep type, threaded hubs.
- C. ACCEPTABLE MANUFACTURERS
 - 1. RACO
 - 2. STEEL CITY
 - 3. APPLETON

2.02 OUTLET BOXES - SHEET METAL

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1.galvanized steel with 1/2 inch (13 mm) male fixture studs where required. Boxes shall be at least 2-1/2" deep and of

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sufficient size to accommodate devices noted. Boxes for fixtures shall have mounting lugs or ears for covers. Wall switch outlet boxes shall be set as indicated above finished floor. Where located near doors, they shall be installed on the *lock* side of the door.

B. ACCEPTABLE MANUFACTURERS

1. RACO
2. STEEL CITY
3. APPLETON

2.03 PULL AND JUNCTION BOXES:

A. Sheet metal junction boxes: ANSI/NEKA OS I

1. Pull and junction boxes shall be fabricated from galvanized sheet steel not less than 16 gauges thick with covers held in place by corrosion resisting machine screws. Boxes shall be furnished and installed where indicated on the plans and where necessary to facilitate cable pulling and splicing. Box size shall be as required by NEC for the number of conduits and conductors entering and leaving it. Where feeder splices are to be made, box shall be large enough to provide ample work space. Boxes shall be installed in locations approved by the Engineer. Exposed junction boxes 4-11/16" x 4" x 4" shall be covered with Bowers #649 and #469 "blank Box covers" respectively.

2.04 CABLE BOXES:

- A. The electrical contractor shall furnish and install junction boxes, pull boxes, cable support boxes, and wiring troughs as shown on the drawings, herein specified or otherwise required. All boxes shall be of the code gauge galvanized steel with screw covers fastened with corrosion resistant machine screws and they may be painted or treated to resist corrosion in addition. Boxes shall be supported independently of conduits entering them. Brackets, rod hangers, bolts or other suitable supporting methods may be used.

PART 3 EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and code compliance.

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- B. Electrical box locations shown on contract drawings are approximate unless dimensioned. Verify locations of outlets in work areas prior to rough-in. owner reserves the right to make minor changes in the location of any switch or box without additional cost prior to installation.
- C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors.
- D. Locate and install to present a neat appearance.
- E. Before any outlet box or switch for use by other trades is set, the exact location required shall be obtained from the contractor installing the equipment. If not adhered to, the Electrical contractor shall be responsible for changes at no cost to the owner or other trades.

3.02 OUTLET BOX INSTALLATION

- A. Provide surface mounted cast metal outlet boxes for devices as per drawings
- B. Provide recessed sheet metal outlet boxes with masonry plaster ring.
- C. Provide knockout closures for unused openings.
- D. Support boxes independently of conduit.
- E. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage.
- F. Coordinate mounting heights and locations of outlets mounted in enclosures or cabinets.
- G. Position outlets to locate luminaries as shown on Room Floor Plans.
- H. Provide surface mounted boxes when designated; secure boxes to wall and accurately position.
- I. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.
- J. Align wall mounted outlet boxes for switches, timers and similar devices.
- K. Provide stainless steel bolts and screws in corrosion resistant applications.

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3.03 PULL AND JUNCTION BOX INSTALLATION

- A. Install pull boxes and junction boxes above in unobtrusive locations.
- B. Support pull and junction boxes independent of conduit.
- C. Provide stainless steel bolts and screws in corrosion resistant applications.

*****END OF SECTION*****

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SECTION 260134 – OUTLET BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Outlet Boxes

1.02 RELATED WORK

- A. Section 260141 - Wiring Devices
- B. Section 260147 - Plate Covers

PART 2 COVERS

2.01 MATERIALS

- A. Boxes: Hot dipped galvanized, designed for masonry installation 1.25 oz. per sq. f t. (381 g/sq. m), or cadmium plated, conform to UL requirements.
- B. Interior Boxes: Cast ferroalloy metal, shallow type.
- C. For ceilings: 4.5 inch (115 mm) octagonal boxes cast ferroalloy for receiving three or less 3/4" (19mm) conduit.
- D. Surface mounted: 4 inch (102 mm) square cast ferroalloy.
- E. Wiring devices to have #302 stainless steel plates (see 260141).

PART 3 INSTALLATION

- A. Surface mount outlet boxes for surface mounted conduits.
- B. Do not use sectional or handy boxes unless specifically requested.

*****END OF SECTION*****

SECTION 260141 – GENERAL PURPOSE WIRING DEVICES

1.0 GENERAL

1.01 WORK INCLUDED

- A. Wall Switches. (General Purpose)
- B. Receptacles (General Purpose)
- C. Device Plates and Box Covers.

1.02 REFERENCES

- A. FS W-C 596 - Electrical Power Connector, Plug, Receptacle and Cable Outlet.
- B. FS W-S-896 - Switch, Toggle.
- C. NEMA WD 1 - General Purpose Wiring Devices.

1.03 SUBMITTALS

- A. Provide product -data showing configuration, finishes, dimensions and manufacturer's instructions.

PART 2 PRODUCTS

2.01 WALL SWITCHES (INDUSTRIAL SPECIFICATION GRADE)

- A. Wall Switches for General Purpose lighting circuits NEMA WD; 1, AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: Ivory plastic.
- B. Toggle switches shall be of the grounding type with hex head grounding screw, rated 20A. 120/277 volt AC only. All switches shall have quiet operating mechanisms without the use of Mercury switches. All switches shall be listed by an "approved" third party agency, approved for the voltage and amperage indicated.

2.02 ACCEPTABLE MANUFACTURERS - WALL SWITCHES (INDUSTRIAL SPECIFICATION GRADE)

- A. Toggle Switches.
 - a. Hubbell 1221-1 single pole 20 ampere.

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- b. Bryant 4901-20 ampere.
- c. Slater Medalist 720-AG-IV 20 ampere
- d. Or Equal

2.03 RECEPTACLES (INDUSTRIAL SPECIFICATION GRADE)

- A. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20 R Ivory Plastic Face.
 - 1. Duplex receptacles shall be of the grounding type, arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20A., 125 volt and the face configuration shall conform to the NEMA Standard No. WDI.101968, and shall be "approved" third-party listed. 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.
 - 2. Receptacles shall be specification grade, mounted vertically. Receptacles mounted over counter, back-splashes, etc., shall be mounted horizontally.
 - 3. Special wiring devices shall be shown on the drawings with complete description thereof.
 - 4. Provide isolated grounding receptacles where indicated on plans.

2.04 GFCI RECEPTACLES (HOSPITAL GRADE)

- A. Exterior and interior receptacles designated as ground fault interrupting shall be hospital grade and be made in conformance with NEMA WD-1-1.10. Models shall be UL listed Certified "corrosion resistant" enduring the 500 hour ASTM B-117-73 salt spray (fog) test. Receptacles shall be NEMA 5-20R configuration rated for 20 amperes and 125 volts AC and be ivory in color.

2.05 ACCEPTABLE MANUFACTURERS RECEPTACLES (GFCI)

- A. Leviton 6398
- B. Hubbell GF-8300I
- C. Or Equal

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2.08 WALL PLATES

- A. Interior Cover Plate Flush: Smooth Stainless Steel

2.09 ACCEPTABLE MANUFACTURERS - WALL PLATES

- A. Hubbell S-8 (General Purpose) (Receptacles Flush)
- B. Crouse-Hinds S1 (Switches 1 gang)
- C. Crouse-Hinds S2 (Switches 2 gang)

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install interior wall switches 48 inches (1.2m) above floor, "OFF" position down.
- B. Install interior convenience receptacles 16 inches (400mm) above floor grounding pole on bottom unless noted otherwise.
- C. Install galvanized steel plates on junction boxes.
- D. Install devices and wall plates flush and level.
- E. Install switches in such a manner that the one nearest the door controls the light or row nearest the door to the further switch and further light or row.

*****END OF SECTION*****

SECTION 260147 – PLATE COVERS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Plate Covers.

1.02 RELATED WORK

- A. Section 260141 - Wall Switches
- B. Section 260141 - Receptacles

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Hubbell
- B. Bryant
- C. Leviton

2.02 MATERIALS

- A. Stainless Steel: Type 302 or 304, No. 4 finish, 0.040 inch (1mm) thick, accurately die cut, protected with release paper. Screws shall be slotted head oval screws to match the material of the plate.
- B. Cast Metal: Die cast profile, ribbed for strength, flash removed, primed with gray enamel, furnished complete with four mounting screws for exposed work.
- C. Gaskets: Resilient rubber or closed cell foam urethane.
- D. Steel: Hot dip galvanized, 1.25 oz./sq. ft. (381 g/sq.m) min.

2.03 PLATES

- A. Flush Mounting Plates: Beveled type with smooth rolled outer edge, stainless steel.
- B. Surface Box Plates: Beveled type with smooth rolled outer edge, stainless steel.
- C. Where two-gang boxes are required for single gang devices, provide special plates with device opening in one-gang and second gang blank.

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- D. Provide stainless steel plates for all new wall switches on existing boxes.
- E. All exterior receptacles shall utilize raintight while in use covers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install coverplates on wiring devices.

*****END OF SECTION*****

SECTION 260190 – SUPPORTING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Conduit and equipment supports
- B. Fastening hardware

1.02 RELATED WORK

- A. Section 16111 - Conduit

1.03 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry. Conduit shall be supported in a method and at a spacing as approved by the NEC, except as designated otherwise.

PART 2 PRODUCTS

2.01 MATERIAL

- A. Support Channel: Galvanized or painted steel
- B. Hardware: Corrosion resistant

PART 3 EXECUTION

3.01 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors and preset inserts.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to piping; ductwork, mechanical equipment or conduit.
- D. Do not use powder actuated anchors.

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- E. Do not drill structural steel members.
- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagonal bolts with spring lock washers under all nuts.
- G. Support lighting fixtures directly from ceiling structural support system. Support fixtures from conduit stems directly to building structure.
- H. Conduit shall be supported by approved pipe straps or clamps:
 - a. Conduit installed on the interior of exterior building walls shall be spaced off the wall surface a minimum of 1/4 inch using "clamp-backs" or strut.

*****END OF SECTION*****

SECTION 260195 – ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Nameplates and tape labels.
- B. Wire and cable markers.
- C. Conduit color coding.

1.02 RELATED WORK

- A. Section 16120 - Wire & Cable.

1.03 SUBMITTALS

- A. Include schedule for nameplates and tape labels.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, blue surface with white core for 120/208 volt equipment. Black surface with white core for 277/480 volt equipment.
- B. Wire and Cable Markers: Metal tags, split sleeve or tubing type.
- C. Self sticking vinyl cloth wire markers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates and tape labels.
- B. Install nameplates and tape labels parallel to equipment lines.
- C. Secure nameplates to equipment fronts using stainless steel self tapping screws. Secure nameplate to inside face of recessed panelboard doors in finished locations. Adhesive to secure plates will not be allowed.
- D. Embossed tape will not be permitted for any application.

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- E. Clean wire and cable with alcohol to receive self sticking wire markers.

3.02 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

3.03 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter height: 1/4 inch (6 mm) for distribution and control equipment identification
- B. Provide nameplates with name, amperage, voltage, and phase.

*****END OF SECTION*****

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SECTION 260450 - GROUNDING

PART 1 GENERAL

- A. Power system grounding

1.02 RELATED WORK

- A. Section 260111 - Conduit.
- B. Section 260120 - Wires and Cables.

1.03 REFERENCES

- A. None

1.04 REGULATORY REQUIREMENTS

- A. All grounding shall be in accordance with the requirements of the latest edition of the National Electric Code. The Contractor shall furnish and install complete and effective grounding for the entire electrical system. Use proper grounding locknuts, bonding type bushings where required, or their suitable devices required.

1.05 TESTS

- A. Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required (maximum of two) until resistance to ground is 25 ohms or less.

PART 2 PRODUCTS

2.01 GROUND BUS

- A. 2 X 1/4 inch (50 X 6 mm) copper minimum, mounted on insulating standoffs, complete with lugs for connecting grounding cables.
- B. Green equipment grounding conductors carried throughout all conduit runs. Ground conductor shall run from panel ground to equipment.
- C. The raceway shall not be relied on for ground continuity.

2.02 GROUNDING ELECTRODES

- A. Ground rods shall be 10 feet long and 3/4" in diameter of copper clad steel construction.

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- B. All ground connections shall be accessible.

PART 3 EXECUTION

3.01 POWER SYSTEM GROUNDING

- A. Circuit Grounding: Install grounding bushings, grounding studs, and grounding jumpers at pullboxes and panelboxes.
- B. Equipment Grounding Conductors: Provide green insulation, size correlated with overcurrent device protecting the wire, attach to grounding bushings on conduit, to lugs on boxes, and other enclosures. Connection to neutral only at service neutral bar. Maintain grounding and neutral separation throughout system from this point. Any dry type transformers are separately derived systems shall have the secondary neutral bonded with an equipment grounding conductor interconnected back to the main system grounding electrode conductor.
- C. Furnish and install double locknuts and insulating bushings, on all conduits entering outer boxes, panelboards, junction boxes, etc., made up tight to insure a continuous ground of minimum resistance from main distribution point on the raceway system. One locknut shall be used on boxes with treated hubs.
- D. All non-current carrying equipment shall be bonded together and grounded. All metallic boxes shall be bonded and grounded. All receptacles shall utilize a "pigtail" jumper wire to the box ground.
- E. Boxes with concentric, eccentric -or oversized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250-94 and lugged to the box.

*****END OF SECTION*****

SECTION 260471 – CIRCUIT BREAKERS AND PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Distribution Panelboards
- B. Branch Circuit Panelboards
- C. Circuit Breakers

1.02 REGULATORY REQUIREMENTS

- A. Construct panelboards to UL standards and provide UL labels.
- B. Width of gutters shall be in accordance with the 2008 National Electric Code, Article 312-8 based on deflection of conductors.
- C. Panelboards identified for use as service equipment shall be so labeled.
- D. Provide “arc flash” warning labels on all panelboards, enclosed circuit breakers and other equipment where this hazard exists.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Square D
- B. Cutler Hammer
- C. General Electric (Type A series with screw cover)

2.02 SUBMITTALS

- A. Submit shop drawings and product data.

2.03 ENCLOSURES

- A. PANELS: Surface mounted complete with panel trim having concealed hinges and trim mounting screws. Provide locking door with flush catch. Panels shall be made of code gauge steel, galvanized. Front shall be of sheet steel with gray lacquer finish. Fronts shall be furnished with approved adjustable trip clamps as a means of securing the front to the box.

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- B. TUBE: Galvanized
- C. KEYS: Provide two keys for each panel. Make keys interchangeable for panels of same voltage.
- D. DIRECTORY: Provide directory holder with glass or plastic plate and metal frame mounted on inside of each door. Circuit directory shall be typewritten.
- D. Provide copper buses in all panelboards throughout.

2.04 PANELBOARDS (277/480 VAC THREE PHASE)

- A. Panelboards: Three phase solid neutral design with sequence style bussing and full capacity neutral and grounding buses composed of an assembly of bolt on (as specified) type molded case thermal magnetic circuit breakers. Provide minimum interrupting ratings of 25,000 AIC AIC. Loadcenters are not acceptable. Ground lugs in lieu of buses are not acceptable. Refer to General Electrical notes on plans and panel schedules for circuit breaker interrupting ratings.

2.05 PANELBOARDS (120/230 VAC SINGLE PHASE)

- A. Panelboards: Single phase solid neutral design with sequence style bussing and full capacity neutral and grounding buses composed of an assembly of bolt on (as specified) type molded case thermal magnetic circuit breakers. Provide minimum interrupting ratings of 10,000 AIC AIC. Loadcenters are not acceptable. Ground lugs in lieu of buses are not acceptable. Refer to General Electrical notes on plans and panel schedules for circuit breaker interrupting ratings.

2.06 CIRCUIT BREAKERS

- A. Circuit breakers shall be bolt-on type of the indicating variety, providing "ON", "OFF", and "TRIP" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position between "ON" and "OFF". All multi-pole breakers shall be so designated that an overload on the one pole automatically causes all poles to be open and it shall be common trip. Field installed handle ties shall not be accepted. The circuit breaker shall be quick-make and quick-break on manual as well as automatic operation and have inverse time characteristics secured through the use of bimetallic tripping element supplemented by a magnetic trip.
- B. No half size or tandem circuit breakers will be allowed.

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PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide mounting brackets, busbar drillings, and filler pieces for unused spaces.
- B. Prepare and affix typewritten directory to inside cover of panelboards indicating new loads controlled by each circuit.

*****END OF SECTION*****

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SECTION 260490 – DISCONNECT SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide and install disconnects for motors.

1.02 RELATED WORK

- A. Section 260111 - Conduit

1.03 REFERENCES

- A. Underwriter's Laboratory, Inc. - Annual Product Directories.
- B. NEMA - Classification of Standard Types of non-ventilated enclosures for Electric Controllers.

1.04 REGULATORY REQUIREMENTS

- A. Conform to National Electrical Code to applicable inspection authority.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Square D
- B. Cutler Hammer
- C. General Electric

2.02 COMPONENTS

- A. Motor disconnects shall have an Underwriter's Laboratory Label.
- B. Disconnects for equipment shall be rated for heavy duty 230 VAC or 208 VAC 3 pole or as designated at ampere rating in schedule. Disconnects shall be non-fusible or fusible as designated. Enclosure shall be Nema 1 for interior or NEMA 3R for exterior.
- C. Disconnects shall be lockable.
- D. All that disconnect shall be equipped with defeatable door interlocks.

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PART 3 EXECUTION

3.01 INSTALLATION

- A. Install motor disconnect adjacent to equipment as indicated on plans.
- B. Padlocks shall be provided for safety switches located in public areas.

*****END OF SECTION*****

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SECTION 260501 – LAMPS

1.01 WORK INCLUDED

- A. Provide and install items as indicated.

1.02 RELATED WORK

- A. Section 260502 - Ballasts & Accessories
- B. Section 260510 - Lighting Fixture

1.03 SUBMITTALS

- A. Submit manufacturer's installation instructions and complete schedule including manufacturer's data and cuts.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric
- B. Phillips
- C. Sylvania

2.02 LED LAMPS

- A. LED Lamps: 4100 K, (85) CRI color rendering index, 180 degree beam spread, +/- 75 K color variation, 45 lumens per watt efficacy.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install lamps in accordance with manufacturer's instructions.

*****END OF SECTION*****

SECTION 260502 – BALLAST & ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide and install required ballasts.

1.02 RELATED WORK

- A. Section 260510 - Lighting Fixtures
- B. Section 260501 - Lamps

1.02 REGULATORY REQUIREMENTS

- A. Provide ballasts that meet standards of an electrical testing laboratory and ANSI C82.11.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric
- B. Advance
- C. Universal

2.02 LED LAMPS - LED DRIVERS

- A.
 - 1. Input voltage 120 VAC
 - 2. Minimum power Factor - .98
 - 3. frequency 60 Hz
 - 4. 1 Channel
 - 5. output volts 6-20 VDC
 - 6. Minimum operating temperature – 20C
 - 7. THD – Less than 10%

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PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide ballasts of compatible design to lamps specified.
- B. Ballast shall be mounted in fixtures to reduce - noise transmission.

*****END OF SECTION*****

SECTION 260510 – LIGHTING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This section includes supply and installations of luminaries, supports and accessories and supply of surface mounted boxes, pendant stems and canopies required for a complete installation.

1.02 RELATED WORK

- A. Section 260120 - Wires and Cables
- B. Section 260190 - Supporting Devices
- C. Section 260501 – Lamps
- D. Section 260502 - Ballasts and Accessories

1.03 SUBMITTALS AND SAMPLES

- A. Submit shop drawings and product data.
- B. Submit shop drawings for luminaries indicating physical characteristics.
- C. Provide complete photometric data and heat dissipation reports from independent testing laboratory.

1.04 INTERFACE

- A. Confirm compatibility and interface of other materials with luminaire and ceiling system report discrepancies to the Engineer and defer ordering until clarified.

1.05 LUMINAIRE DESIGNATIONS

- A. Luminaries: LED type

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. See lighting fixture schedule.

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2.02 LED LUMINAIRE

- A. Prime coat and finish in high reflectance baked enamel, two coats minimum of exposed and reflective surfaces, giving reflectance of 85 percent.
- B. Reflective -plates may be 22 gauge (0.80 mm) metal for modular fluorescent fixture and 20 gauge (0.90 mm) steel housing.
- C. Provide 20 gauge (0.90 mm) steel housing.
- D. Provide hinged ' frames with catches, removable for cleaning without tools. Support surface mounted fixtures from building structure.
- E. Provide gasketing, stops and barriers to form light traps and prevent light leaks.
- F. Design luminarie to dissipate ballast and lamp heat.
- G. Ballasts shall be electronic and meet the following criteria:
 - a. Driver to be UL Listed as Section 260502.
- H. Provide T08 energy saving lamps as indicated. Fluorescent lamps shall meet EPA guidelines regarding the toxicity characteristic leaching procedure (TCLP).
- I. Use formed or ribbed backplates, endplates, reinforcing channels.
- J. Surface mounted fixture shall be UL rated for low density ceilings.
- K. Paint finishes shall be baked on enamel painted finish or standard color to be designated by owner.
- L. Provide luminaire disconnecting means as required by 2011 NEC 410.73 (G) 2008 410.130 (G).

2.03 EMERGENCY EXIT LUMINAIRE

- A. It shall be completely self-contained, provided with maintenance-free battery; automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and met or exceed the following standards; NEC, NC Building Code, Volume X Energy Code, NFPA-101, and NEMA standards.
- B. The contractor shall perform a test on each emergency lighting unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested

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for 90 minutes. The test shall demonstrate that the batteries conform to the requirements of NEC 700.12 (F). The battery test shall be done 10 days prior to the final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced, and tested again. A copy of the test report shall be sent to the State Construction Office.

2.04 EMERGENCY EGRESS LUMINAIRE

- A. Shall be completely self-contained, provided with maintenance-free 12 volt battery, automatic charger, two lamps, and other features. Luminaire shall be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy Code, NFPA-101, and NEMA standards.
- B. The contractor shall perform a test on each exit sign after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The test shall demonstrate that the batteries conform to the requirements of NEC 700.12 (F). The battery test shall be done 10 days prior to the final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced, and tested again. A copy of the test report shall be sent to the State Construction Office.

PART 3 EXECUTION

A. INSTALLATION

3.01 SUPPORTS

- A. Refer to Section 230190.
- B. Provide concealed EMT raceway and boxes mounted in concealed ceilings.
- C. Where a recessed fluorescent, high intensity, or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the luminaire and the other end to the building's structural system. The lay-in luminaire shall then be screwed to the main runners of the lay-in ceiling track at all four (4) corners using sheet metal screws. For fire rated suspended ceiling, luminaire shall be supported to the Building Structure as per the Ceiling Design Criteria, luminaire shall then be screwed to the main runners of the suspended ceiling, track at all four (4) corners using sheet metal screws. It is the electrical designer's responsibility to make sure this work is coordinated with the work of the ceiling contractor through the ceiling specifications. Also, see the ASTM Section "E-580-02" items 3.3, 4.3, 5.5, and 5.6 and the NEC 410-16C.

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- D. Mount perimeter canopy and post lighting fixtures at mounting heights indicated.

*****END OF SECTION*****

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SECTION 260512 SPORTS AND AREA LIGHTING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. This section includes supply and installations of luminaries, supports and accessories and supply all boxes and accessories required for a complete installation.

1.02 RELATED WORK

- A. Section 16120 - Wires and Cables
- B. Section 16190 - Supporting Devices
- C. Section 16501 – Lamps

1.03 SUBMITTAL AND SAMPLES

- A. Submit shop drawings and product data.
- B. Submit shop drawings for luminaries indicating pertinent physical characteristics.
- C. If requested by the Engineer/Architect, provide complete photometric data and heat dissipation report from independent testing laboratory.
- D. Provide sample luminaire to Currituck County for inspection if required.
- E. Provide point by point computerized foot-candle layout for parking lot.

1.04 INTERFACE

- A. Confirm compatibility and interface of other materials with luminaire and other system. Report discrepancies to the Engineer and defer ordering until clarified.
- B. Provide pedestal bases for parking lot and pedestrian lighting including forming and framing per details as described on drawings (See lighting fixture schedule) with selected distribution.

1.05 SPORTS FLOOD FIXTURES

- A. Provide sports floods as Musco TLC-LED per plans (preferred vendor)

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1.06 AREA LIGHTING FIXTURES

- A. Provide 30ft. (17,871 lumens) LED for parking lot lighting. See lighting fixture schedule.
- B. Provide 22ft. (14,764 lumens) LED for pedestrian lighting. See lighting fixture schedule.

1.07 POLES

- A. Area lighting poles shall be round tapered anodized aluminum white finish per lighting fixture schedule for 30ft. and 22ft. foot mounting. Poles shall have an EPA rating for 110 mph winds for the twin mount style luminaires. Include bonding and grounding lug inside handhole.
- B. Provide anodized aluminum anchor bolt cover to completely enclose pole foot,. Provide finish to match pole.
- C. Poles and pedestals for sports flood lighting shall be Musco per plans. See sheet E/104A

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Musco TLC-LED preferred vendor.
- B. See lighting fixture schedule.

PART 3 EXECUTION

A. INSTALLATION

3.01 SUPPORTS

- A. Install area lighting on formed concrete pedestal bases.

*****END OF SECTION*****

SECTION 260750 – TELEPHONE/DATA SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SUBMITTALS

General: Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification. Where a submitted item does not comply fully with each and every requirement of the specifications, the submittal shall clearly indicate such deviations. Identification requirements for non-complying features of items are very specific.

Shop drawings for the system shall be submitted in a single package and shall include:

Product Data: Submit manufacture's technical product data including specifications and installation instructions, for each component of the system required. Include data substantiating that equipment and materials comply with requirements. Literature shall indicate the function of each item and shall be cross-referenced to the Block Diagram.

Block Diagram: Submit a Block Diagram of the system showing all components and all connections. The Block Diagram shall clearly indicate all items that are supplied under other sections of these Specifications. Block Diagram shall show typical outlets and cables to each type of outlet. Block Diagram shall show layout of distribution frame including type of enclosure each type and quantity of distribution equipment. (Patch panels, splitters, etc.) to each distribution frame.

1.03 QUALITY ASSURANCE

Codes and Standards

Electrical Code Compliance: Comply with applicable state code requirements of the authority having jurisdiction and appropriate NEC articles as applicable to the indicated equipment

Testing Laboratory Compliance: Comply with applicable requirements of relevant UL standards. Provide equipment that is Listed and Labeled.

Special Use Markings: Provide equipment, constructed for special use, with appropriate Listed marks that indicated suitability for special type of use or application indicated.

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State STS-1000 Compliance: Data wiring associated with state projects shall meet all applicable criteria of the latest edition of “North Carolina State STS-1000 Telecommunications Guidelines” which are included at the end of this specification.

PART 2 PRODUCTS

- A. The system shall in general comply with the requirements of EIA/TIA-568A (Commercial Building Standard for Telecommunications Wiring), EIA/TIA-569 (Commercial Building Standard for Telecommunications Wiring), EIA/TIA-569 (Commercial Building Standard for Telecommunications Pathways and spaces), EIA/TIA-607 (Commercial Building Telecommunications Grounding/Bonding Requirements), EIA/TIA 67 (Transmission Performance Specification for Field Testing of Unshielded Twisted-Pair Cabling Systems), and EIA/TIA 72 (Centralized Optical Fiber Cabling Guidelines).

2.01 OUTLET JACKETS

- A. Outlet jacks shall be modular with snap-in modules capable of numerous jack module combinations including RJ45, Fiber S.T., Angled Connectors, Type F, RJ11 and RCA Connectors. All combinations shall be capable of fitting on a single gang cover plate. Faceplates shall be manufactured by Ortronics, Amp, Siemon, or Superior. Outlet combination as shown on the drawings shall be composed of the following requirements. The campus provided voice over IP; therefore, all cables for voice are Cat 6E with the exception of 12 conventional voice lines which shall be Cat 3. All interior cables shall be provided with plenum rated jackets.

2.02 CABLE

- A. Category 6-All copper station cable for voice (white)/data (blue) shall be UL listed, 4 pair, Category6E, CMP rated as defined in EIA/TIA TSB-36 bulletin (intended for use with transmission rates up to 250 Mbps) with the following characteristics.

Frequency	1	4	8	10	16	20	25	31.25	62.5	100	200
250											
(MHz)											
Insertion	2.0	3.8	5.4	6.0	7.6	8.6	9.6	10.8	15.6	20.2	30.0
34.1											
Loss (dB)											
Next (dB)	78.7	69.0	64.2	62.6	59.2	57.6	56.0	54.4	49.4	45.9	40.8
39.1											
ACR (dB)	76.6	65.2	58.8	56.6	51.6	49.1	46.4	43.6	33.7	25.7	10.8
5.0											

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PS Next	77.8	68.0	63.1	61.5	58.1	56.5	54.8	53.2	48.1	44.6	39.4
	37.7										
(dB)											
PSACR	75.8	64.2	57.7	55.5	50.4	47.9	45.2	42.4	32.4	24.3	9.4
	3.5										
(cB)											
ELFEXT	69.3	57.2	51.2	49.3	45.2	43.2	41.3	39.4	33.3	29.3	23.2
	21.3										
(dB)											
PSEFEXT	68.3	56.2	50.2	48.3	44.2	42.2	40.3	38.4	32.3	28.3	22.2
	20.3										
(dB)											
Return	23.0	23.0	23.0	23.0	22.0	21.5	21.0	20.5	18.0	16.0	13.0
	12.0										
Loss (dB)											
Delays	580	562	557	555	553	552	551	550	549	548	547
	546										
(ns)											
Delay	30	30	30	30	30	30	30	30	30	30	30
	30										
Skew (ns)											

All interior cable shall be plenum rated, NEC rated CMP. Provide number of cables as outlined on the drawings. Distribution cables shall be suitable for use (indoor, outdoor, distribution, breakout, etc.)

Provide white cable for telephone and blue cable for data, one cable per jack.

2.03 TERMINATION

- A. Copper Patch Panels-Provide 24/48 port, rack mountable, modular to 110, category V compliant patch panels. Panels to use EIA/TIA 568A wiring scheme. Panels as manufactured by Ortronics, Amp, Siemon, or Suprior.
- B. At termination points for copper distribution cable that exits the building, provide surge suppression near to the exit/entrance point to the building. Surge protection to be Lucent Technologies 110ANA1-25 Multipair Protector Panels or approved equal.

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2.04 ENCLOSURES AND EQUIPMENT

- A. 19" Racks-Provide 7' tall, 19" supporting rack with black anodized aluminum cross members. Rack shall be securely bolted to floor. Provide wire management systems on both sides of rack. Provide rack mounted outlet strip with 6 outlets, minimum, constructed of a steel housing with matte black anodized finish, resettable overload circuit breaker and switch with pilot light. Provide with 15' power cord and mounting accessories. Power strip shall be surge protected to meet UL 1449 listing.
- B. Breakout Box-Provide 17.25" x 11.25" x 3.5" minimum size wall mounted steel cabinet to serve as Premises Interconnect Center. Cabinet shall provide two hinged doors with locks to separate fiber and ST jacks. Provide strain relief for cables and two splice trays. Provide one panel for 12 single mode fibers with ST ceramic inserts and one panel for 24 multimode fibers with ST ceramic inserts. Provide typed label index on interior of both doors.

Data cabinets- see drawings for description and requirements.

Telephone Backboards-Provide telephone backboards sized and located as indicated on the drawings. Backboards to be composed of 3/4" thick fire retardant exterior grade plywood. Backboard to be painted white as noted on plans.

PART 3 EXECUTION

Provide a copper grounding bus at the main distribution frame and each intermediate distribution frame. Route 1 #6 copper ground wire from each distribution frame to building steel.

Route all cables in raceway within wall and inaccessible ceiling spaces.

Use nylon bushings at top of conduit where stubbed in accessible ceiling spaces.

Support all cables using cable tray or J type hooks where cable tray is not available.

All cables shall be terminated using appropriate termination equipment.

Copper distribution cables shall be punched down in a pair per port configuration. The cable shall be terminated on the WHT/BLU and BLU-WHT 110 connectors at panels.

Provide appropriate cable management devices in all distribution frames to insure a neat appearance. The use of cable ties is prohibited.

No cable length shall exceed 295 feet.

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PART 4 TESTING

UTP Testing

All cable pairs must be tested for the following conditions:

1. Polarity
2. Reversal of pairs
3. Wire transpositions
4. Continuity
5. Opens
6. Shorts
7. AC and DC foreign voltages
8. Level 5 NEXT end to end from faceplate through 110 connecting block and/or patch panel and jumper.
9. EIA/TIA 568A wiring discrepancies

All test data will be documented and provided to the using agency at the time of acceptance.

A final report should be compiled which records system configuration, fiber labels, cable routes and “as built” details. Loss measurements and OTDR traces should also be included.

PART 5 LABELING

General Rules

ANSI/TIA/EIA 606 Administration standard for the Telecommunications Infrastructure of Commercial Buildings is incorporated and is to be complied with.

Each pathway (conduit, tray, raceway, etc.) that conveys telecommunications media from space to space must be given a unique identifier and labeled at each end-point.

Each telecommunications space (equipment room, telecommunications closet, work area, entrance facility, manhole and handhole) must be uniquely identified and labeled. Provide phenolic labels on each distribution frame, cabinet, enclosure or rack.

Each cable record must indicate the cable type by manufacturer and manufacturer’s designation, and document every pair/conductor in the cable. Cable identifier must be linked to all pathways in which it runs.

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Each outlet is to be labeled. Labels are to be printed or typed. Provide self-adhesive labels unless provision for labeling is integral to the outlet.

Each piece of termination hardware such as a patch panel or wiring block must be uniquely named and labeled. Use printed self-adhesive labels.

Termination position on cross-connect must be identified by type, the pair/conductor terminated and a user code.

Labeling

Each work area is labeled with a unique identifying number. A consistent labeling and numbering scheme shall be used. The labeling shall be clearly legible on the outlet face and the termination end. The numbering plan should identify the source and destination of the cable for horizontal runs. A sample number plan is:

208A-A1/241B

Where 208 is the telecommunications closet room #:

“A” is the patch panel identification

“A1” is the “A” Block and the first position

“241” is the workstation room #

and “B” is the work space of the user in room 241

Horizontal cable shall be labeled at the workstation end and the cross-connect end. Backbone cables (whether riser or horizontal) shall have an identifying number that is labeled at each end. Labels shall be the same color on each end. Performance documentation must use the same labeling scheme.

PART 6 CLOSEOUT

The Contractor shall provide the Owner with a report outlining all tests previously noted. The Contractor shall provide a block diagram identifying all distribution frames, cabinets, backboards, and the size and number of cables and conduits between each, as well as an outline of each unique type of outlet and connecting cable.

Provide minimum of a 10-Year Cabling System Warranty from the system manufacturer. This warranty shall guarantee end-to-end system performance, shall cover both components and cabling, and shall cover materials and labor. This type of warranty, available from various system manufacturers, requires that installers be approved by, and registered with the system manufacturer.

*****END OF SECTION*****

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SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Temporary erosion- and sedimentation-control measures.
6. Selective thinning of existing woods.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion- and sedimentation-control measures.
2. Division 01 Section "Execution" for field engineering and surveying.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that 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.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

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- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

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

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, 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. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.

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- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and 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.
- I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

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3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.

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3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots, obstructions, to whatever depths are encountered.
 - 3. Dispose of all clearing debris in a legally approved off-site landfill.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil off site in a legally approved waste area. Surplus topsoil is that which can not be reused on site.
 - 4. Temporarily stockpile/Salvage surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

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3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

3.9 SELECTIVE THINNING

- A. Existing wooded areas where indicated on the plans shall be under-brushed and thinned of existing vegetation and under-brush. Within the areas indicated thinning shall consist of removal to the ground (below existing mulch layer) of all vegetation 2 inch caliper and smaller. Remaining vegetation shall be limbed up to 8 feet height. Completely remove all dead vegetation in the thinning area.
- B. Cleared materials and debris shall be finely chipped and spread in thinning area or existing woods to remain. The depth of chipped debris shall not exceed 4 inches.
- C. Stump treatment: Immediately after removing vegetation apply Round-up or approved equal to the remaining stump. Apply Round-up at 100% cut stump rates per manufacturer's instructions. Do not dilute mixture with water. Apply a second stump treatment at the same rate the next day after initial treatment.

END OF SECTION 31 10 00

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SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Geotechnical report prepared by Terracon dated January 31, 2025.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, parking areas, walks, pavements, non-athletic field, lawns, and athletic field turf.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete pavements.
 - 5. Subbase and base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling for utility trenches.
 - 8. Excavating and backfilling trenches for buried electrical utilities and pits for buried utility structures.
 - 9. Infield mixture for athletic fields.
 - 10. Warning Track Material
- B. Related Sections include the following:
 - 1. Division 01 Section "Unit Prices" for unit-price plowing, drying, and compacting owner's stockpile material (borrow), borrow reclamation from County's stockpile, unclassified excavation (undercut), contractor furnished offsite borrow (imported fill) and comprehensive rough grading provisions.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
 - 3. Division 02 Section "Athletic Fields" for finish grading including placing and preparing sand, rootzone material, and soil amenities for athletic field turf.
 - 4. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
 - 5. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 6. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
 - 7. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

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8. Division 32 Section "Turf and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.
9. Division 33 Section "Subdrainage" for drainage of foundations, slabs-on-grade, walls, and playground areas.

1.3 UNIT PRICES

- A. Unit prices for earthwork are included in Division 01 Section "Unit Prices."

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- D. Borrow Soil: Satisfactory soil imported from County's on-site stockpile or Contractor's off-site source for use as fill or backfill includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
 1. Authorized Additional Excavation(Undercut): Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Compensation, shall be without additional compensation.

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- G. Fill: Soil materials used to raise existing grades includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- 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. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk includes transportation on the site, to the site, placement in proper lifts, and compaction to densities specified in this section and on plans.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Geotextile.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.
- 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 earthwork operations. Submit before earthwork begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall only use approved truck routes for hauling of equipment, select material for bedding or backfill, excess or spoil dirt for disposal, etc. Approval for hauling shall be obtained from appropriate governing agency (NCDOT, Currituck County, local regulatory agency, private property owner, etc.) prior to start of work.
- B. Where necessary for the Contractor to remove and/or purchase fill material from a borrow site, said site shall comply with requirements for a permitted quarry operation as set by NCDENR.
- C. Soil stockpiles shall be protected to prevent erosion in accordance with NCDENR requirements.
- D. No stockpiling of backfill, spoil, aggregate, or other construction material or debris shall be permitted on a street open to vehicular traffic without an approved plan for signing, barricading, and detouring as necessary.
- E. The Contractor shall immediately notify the Architect and cease related excavation activities upon the discovery of abandoned graves, wells, fuel tanks, and hazardous or non-hazardous waste disposal sites.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Use the County's borrow source until empty and then use the Contractor's borrow source until final grades are achieved. Payment for borrow will be billed against UP-2, 3, or 6.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups. Payment for undercut will be billed against UP-4 or 5.

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1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- G. 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 (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- I. 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 (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- L. Infield Mixture: Shall be 70% clay silt and 30% sand with a surface conditioner (turface, diamond pro, etc.) applied ("cut in") at 1/2" depth per skinned infield. Depth of mixture shall be as shown on plans. Sample of soil mixture shall be submitted to owner for approval prior to construction. Payment for this material shall be included in the base bid.

Proportions of clay shall be increased at the pitcher's mounds/rubber and home plate to create firm, stable, mound and batter's box.

Permittivity: 0.2 per second, minimum; ASTM D 4491.

Approved Conditioner and mixture suppliers:

- a. **Forbes Sand Company-Owner Preferred Material**
Shawboro, NC 27973
1-252-336-2673
- b. Louisburg Clay Company
Wade Moore
919-496-3794
- c. Nolan Thomas and Company
P.O. Box 369
Stovall, NC 27583

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Nolan Thomas
888-457-7678 % sand, 25% clay, 15% silt mix)

d. Cunningham Brick
[www.cunningham brick.com](http://www.cunninghambrick.com)

e. Burnett Lime Company
800-726-4187
Southern Athletic Field
Columbia, Tenn.
800-837-8062

f. Diamond Pro
Dallas, Tx
www.diamondpro.com

M. Warning Track Mixture: Shall be screened brick dust. See manufacturers above. Depth of mixture shall be as shown on plans. Sample of soil mixture shall be submitted to owner for approval prior to construction. Payment for this material shall be in the base bid.

N. Infield Gravel Drainage Material: Gravel drainage material shall consist of washed crushed stone. Gravel of soft origin, such as limestone, coral, or other calcareous materials will not be used. Gravel components shall not exceed 12% loss of materials as determined b/a Sulfate Soundness Test (ASTM C38) and the loss shall not exceed 40 as determined by the L.A. Abrasion Test (ASTM C131). The stone material shall be used for the trench fill around and above the lateral drain pipes. Payment for this material shall be in the base bid.

a. The gravel shall have a mean diameter of 4.0 to 8.0 millimeters and a particle size that approximates the following criteria:

SIEVE SIZE	DIAMETER	RETAINED SIEVE
1/2"	12.5 mm	0
3/8"	9.5 mm	Less than 5%
1/4"	6.3 mm	20-30%
5"	4.0 mm	40-50%
10	2.0 mm	10-20%
<10	<2.0	<10%

Uniformity coefficient (C_u) – D_{90}/D_{15} C_u should be less than 2.5

D_{15} gravel less than or equal to 5 x D_{85} sand (Bridging)

D_{15} gravel greater than 5 x D_{15} sand (Permeability)

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2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
 2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
 3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
 4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
 5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
 6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
 7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation 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. Survivability: Class 2; AASHTO M 288.
 2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
 3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
 4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
 5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
 6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
 7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- C. Infield geotextile filter fabric will be a non woven filter fabric consisting of long-chain synthetic polymers composed of at least 85% by weight polyolefins, polyesters, or polyamides and exhibiting the following physical properties:
1. Grab Test: 90 lbs minimum ASTM D4632.
 2. Puncture Test: 60 lbs minimum ASTM D4833.
 3. Burst Test: 215 PSI minimum ASTM 53786.
 4. Trapezoid Tear Strength: 42 lbs maximum ASTM D4533.
 5. Permeability: 0.1 CM/SCC minimum ASTM D4491.
 6. Apparent Opening Size: #50 Sieve Size ASTM D475

This material shall be capable of percolating water at a minimum rate of 25 inches per hour.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

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- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) 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 (750 mm) 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
- D. Provide subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- E. Contractor shall provide a minimum of one competent person at each construction site where excavations are in progress. A competent person shall mean one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorized to take prompt measures to eliminate such conditions.
- F. All surface encumbrances, fall hazards, and load overburdens such as stored materials, soil stockpiles, co-workers or on-lookers, pump, loaders, other equipment, etc. shall be removed or relocated away from excavations a sufficient distance to prevent hazards from falling objects and trench wall cave-in or collapse.
- G. Contractor shall provide sufficient access and egress for all employees. A stairway, ladder, ramp, or other safe means of access and egress shall be located in trench excavations that are four (4') feet or more in depth so as to require no more than twenty-five (25') feet of lateral travel for employees.
- H. Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 1926.652 (b), Design of Sloping and Benching Systems, and Other Protective Systems except where excavations are found by a competent person to be

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entirely in stable rock or in excavations which are less than five (5') feet in depth and present no indication of potential cave-in.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
 - 3. The dewatering system is whatever system is needed to draw down and maintain ground water below elevations and line specified on the drawings. Measures include trenches, pumps, well points, sheet piling, and whatever equipment and maintenance thereof to prevent ground water from rising in the project area.
 - 4. The Contractor shall at all times provide and maintain ample means and equipment with which to remove and properly dispose of any and all water entering the excavation.
 - 5. No water shall be allowed to rise around the pipe in unbackfilled trenches, nor shall water be allowed to rise over masonry until the concrete or mortar has set for minimum of twenty-four (24) hours. All water pumped or drained from the work area shall be disposed of in such a manner as to prevent siltation and erosion to adjacent property, streets, drainage ditches, natural water features, or storm drainage.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL-Payment will be billed against UP-7.

- A. Unclassified Excavation (Comprehensive Rough Grading): Excavate to subgrade elevations and sections and as illustrated on the drawings regardless of the character of surface and subsurface conditions encountered.
 - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with satisfactory and unsatisfactory soil, boulders, and other materials not classified as rock or unauthorized excavation (undercut).
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
- B. Excavation shall include stockpiling of materials suitable for backfill.
- C. Excavation shall be in accordance with the geotechnical report.

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3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). 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 (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

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1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
2. The trench bottom shall be shaped to conform to the exterior of the pipe with bell holes at each joint to provide full support along the entire length of pipe with soil and/or bedding as shown on the Typical Cross-Section on the drawings.
3. If during the course of construction, the trench should be inadvertently over-excavated, the Contractor shall fill the trench to grade with approved material and compact to a minimum AASHTO T99 density of Ninety (90%) percent.
4. Where an unstable trench bottom condition is encountered, the Contractor shall stabilize the trench bottom by excavating and installing satisfactory fill material and compacting to a minimum AASHTO T99 density of Ninety (90%) percent. Do not excavate unstable trench bottom until it has been classified and cross-sectioned by Architect. The Contract Sum will be adjusted for unsatisfactory soil excavation (below trench bottom shown on typical section) according to unit prices included in the contract documents. Changes in the contract time may be authorized for excavation.

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 1. The Contract Sum will be adjusted for unsatisfactory soil excavation (below subgrade) according to unit prices included in the Contract Documents. Changes in contract time may be authorized for excavation.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes). Truck shall be sufficiently loaded with ballast to provide a minimum weight of thirty (30) tons.
 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
 4. Proof-roll shall only be performed within ten (10) days of placement of stone or pavement. If precipitation occurs after proofrolling, but prior to placement of stone or asphalt, then the surface will need to be proofrolled again.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 1. Areas of excessive pumping in fill areas placed by Contractor will not be considered for additional excavation.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

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3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 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. Do not store within drip line of remaining trees.

3.11 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.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.

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1. Carefully hand compact initial backfill in six inch layers under pipe haunches and compact to AASHTO T99 density of ninety (90%) percent evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit.
 2. Whenever shoring, sheeting, and/or bracing are used, trench protection shall be left in place at least until the pipe has been laid and backfilled to a point two (2') feet above the pipe. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the backfill and trench walls. Sheeting shall not in any way be braced against the pipe. Sheeting may be trimmed and left in place only with prior written approval from the Architect.
 3. Whenever a movable steel box is used as a shield system, care shall be taken to protect the integrity of the pipe bedding and to prevent the pipe from moving when the steel box is moved. The pipe must be secured to prevent longitudinal movement. If steel trench boxes are to be stacked for use in deeper trenches, each box section shall be designed and approved for such installations by the manufacturer, and the sections shall be rigidly attached such that all sections shall move and function as one unit.
- E. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation. Machine place in uniform loose lifts of six to eight inch layers and compacted to the density as specified on drawings.
- G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.
- H. All trenches and similar excavations will be filled, compacted, and permanently resurfaced within 72 hours of completing the associated construction work, unless exception is made by Architect.
- I. Where trench excavation crosses surface structures such as sidewalks, curbs and gutters, etc, the Contractor shall remove joint-to-joint sidewalk and/or curb and gutter and replace in kind. Contractor shall not excavate under surface structures without removing and replacing the structure.

3.13 SOIL FILL

- A. Preparation: Remove vegetation, construction materials, lumps, clods or rocks larger than six (6") inches in their greatest diameter with no more than 15% of the lumps or rocks greater than two (2") inches in their greatest diameter, frozen or excessively wet material, debris or other objectionable materials which would hinder placement, compaction, and consolidation of the backfill material, topsoil, debris, unsuitable soil materials, obstructions, and deleterious materials from ground surface before placing fills. Stock pile topsoil and re-spread over non-structural areas to finish grades shown on drawings.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:

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1. Under grass and planted areas, use satisfactory soil material. Unsatisfactory soil may be useable if approved by Architect.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.
6. Under athletic fields, use satisfactory soil material.

D. Place soil fill on subgrades free of mud, frost, snow, or ice.

E. Fill shall be in accordance with the geotechnical report.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 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. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 98 percent.
2. Under walkways, scarify and re-compact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under athletic field, lawn or unpaved areas, scarify and re-compact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85-90 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

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3.16 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.
 3. Tops and bottoms of all slopes: Round tops and bottoms of slopes and drainage swales. Adjust and warp slopes, at intersections of cuts, and fills, to flow into each other or into the existing natural ground surface without noticeable break. Cuts and fills shall have a maximum slope of 3' horizontally to 1' vertically, unless otherwise shown on the contract drawings. The finished surface of all lawn areas after planting shall not be less than ½ inch below the finished grade of all walks or other surface areas.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 2. Walks: Plus or minus 1/2 inch (13 mm).
 3. Pavements: Plus or minus 1/2 inch (13 mm).
 4. Any deviation in excess of the above amount shall be corrected by the Contractor by loosening, adding or removing material, reshaping, and compacting as directed by the Architect at no additional cost.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
- D. Grading of all Lawn and Ballfield Infields Areas – Both Athletic and Non-athletic: All areas receiving a natural grass surface or infield mixture shall have an additional smoothness requirement. Finished grade shall have no high or low spot greater than ¼ inch every ten feet.
1. Any deviation in excess of the above amount shall be corrected by the Contractor by loosening, adding or removing material, re-shaping, and compacting as directed by the Architect for no additional cost.
 2. Use industry standard “laser” grading equipment typical for athletic field construction.
 3. Contractor is responsible to perform finish grading for the sub-grade and soil conditioner material for the natural grass surface.
 4. Contractor is responsible to perform finish grading for the natural grass surface. Proposed elevations for natural grass areas (athletic fields) shown on plan are to finish grade. Finish grade for athletic fields is defined as uppermost playing surface(top) of grass surface including the rootzone or infield mix material.

3.17 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

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1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 698.
 2. See drawings for typical cross section and subsurface drain locations.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 698].
 2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.
 3. See drawings for typical cross section.

3.18 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends, where and if indicated.
 2. Place base course material over subbase course under hot-mix asphalt pavement.
 3. Shape subbase and base course to required crown elevations and cross-slope grades.
 4. Place subbase and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
 5. Place subbase and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

3.19 DRAINAGE COURSE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

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2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner reserves the right to engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 4000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than 3 tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet (30 m) or less of wall length, but no fewer than 2 tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet (46 m) or less of trench length, but no fewer than 2 tests.
- E. 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 to depth required; recompact and retest until specified compaction is obtained.

3.21 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 Architect; reshape and re-compact.

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- 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.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

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SECTION 31 23 19 - DEWATERING

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 construction dewatering.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for excavating, backfilling, site grading, and for site utilities.

1.3 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Delegated Design: Design dewatering system, using performance requirements and design criteria indicated.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.

1.4 SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

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1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in dewatering work.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Architect's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
 - 2. The geotechnical report is included elsewhere in the Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate

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routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Monitor dewatering systems continuously.
- E. Promptly repair damages to adjacent facilities caused by dewatering.
- F. Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 01 Section "Temporary Facilities and Controls" and Division 31 Section "Site Clearing" during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 1. Maintain piezometric water level a minimum of 24 inches (600 mm) below surface of excavation.
- E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

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1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 31 23 19

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SECTION 31 30 00 — TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following for termite control:
 - 1. Soil treatment.

1.2 DEFINITIONS

- A. EPA: Environmental Protection Agency.
- B. PCO: Pest control operator.

1.3 SUBMITTALS

- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
- B. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and North Carolina Department of Agriculture, Structural Pest Control Division.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.6 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

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1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. Warranty Period: Three years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

- A. Continuing Service: Provide a proposal for continuing service, including monitoring, inspection, and retreatment for occurrences of termite activity, from applicator to Owner, in the form of a standard yearly (or other period) continuing service agreement, starting on the date of Substantial Completion. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

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3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
 - 1. Slabs-on-Grade, Footings, and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 - 4. Masonry: Treat voids.
 - 5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- c. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 30 00

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SECTION 316219 - TIMBER PILES

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 round timber piles.

1.3 UNIT PRICES

- A. Contract Sum: Base Contract Sum on number and dimensions of piles indicated from tip to cutoff, plus not less than 12 inches (305 mm) of overlength for cutting piles at cutoff elevations.
- B. Work of this Section is affected as follows:
 - 1. Additional payment for pile lengths in excess of that indicated, and credit for pile lengths less than that indicated, is calculated at unit prices stated in the Contract, based on net addition or deduction to total pile length as determined by Architect and measured to nearest 12 inches (305 mm).
 - a. Additional payment for splices required to extend pile lengths in excess of that indicated is calculated at unit prices stated in the Contract.
 - 2. Additional payment for number of piles in excess of that indicated, and credit for number of piles less than that indicated, is calculated at unit prices stated in the Contract.
 - 3. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing of cutoffs.
 - 4. Test piles that become part of permanent foundation system are considered as an integral part of the Work.
 - 5. No payment is made for rejected piles, including piles driven out of tolerance, defective piles, or piles damaged during handling or driving.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

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- B. Shop Drawings: For timber piles. Show fabrication and installation details for piles, including details of driving shoes, tips or boots, and pile butt protection.
 - 1. Include arrangement of test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Round timber pile treatment data as follows, including chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material:
 - 1. For each type of preservative-treated timber product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
- C. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.
- D. Dynamic Pile Test Reports: Submit within three days of completing each test.
- E. Pile-Driving Records: Submit within three days of driving each pile.
- F. Certified Piles Survey: Submit within seven days of pile driving completion.
- G. Field quality-control reports.
- H. Material Certificates: For preservative-treated piles. Indicate type of preservative used and net amount of preservative retained.
- I. Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 - 1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-driving records.
- B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

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1.8 PRECONSTRUCTION TESTING

- A. General: Dynamic pile tests are used to verify driving criteria and pile lengths and to confirm allowable load of piles.
1. Furnish test piles 60 inches (1524 mm) longer than production piles.
 2. Determination of actual length of piles is based on results of dynamic pile tests.
- B. Pile Tests: Arrange and perform the following pile tests:
1. Dynamic Pile Analysis:
 - a. Dynamic testing provides supplemental information for evaluating pile integrity, hammer and drive system performance, assess pile installation driving stresses, and pile capacities. Perform dynamic testing on 4 of the test piles (2 at each boardwalk) during the full length of the pile driving and during restrike a minimum of seven days after initial driving. Use test piles of type as specified elsewhere in this section. Provide equipment to obtain dynamic measurements, record, reduce and display its data that meet the requirements of ASTM D4945. The equipment must have been calibrated within 6 months prior to the start of the testing operations and thereafter throughout the contract duration. Drive test piles at the locations indicated. Employ an independent inspection firm, hereinafter referred to as the "Contractor's Geotechnical Consultant", experienced in the pile driving process, monitoring of test pile installation, and in the use of the Pile Driving Analyzer and its related equipment. Perform dynamic pile analysis as follows:
 - 1) Pile Analyzing - 30 working days prior to driving the test piles, submit the pile and complete driving equipment data to the County Project Manager. The Contractor's Geotechnical Consultant must use the submitted information to perform wave equation analyses and must prepare a summary report of the wave equation results. The wave equation analysis using GRLWEAP software by Pile Dynamics, Inc. or equivalent must be used to assess the ability of the proposed driving system to install the pile to the required capacity and desired penetration depth within the allowable driving stresses. Approval of the proposed driving system by the County Project Manager must be based upon the wave equation analyses indicating that the proposed driving system can develop a pile capacity of 11 kips at a driving resistance within allowable driving stress limits. The hammer must also be sized or adjustable such that the penetration per blow at the required ultimate capacity does not exceed 0.5 inches.
 - 2) Pile Drivability - Perform each dynamic pile analysis in two steps. The first step is to check the hammer, pile and soil performance, and to determine the suitability of the proposed hammer for the size, length and type of pile being installed for the soil types encountered as the piles are driven. This initial monitoring must determine whether pre-augering or jetting is appropriate, efficiency of the hammer relative to specified efficiency, effectiveness of cushion, level of compressive and tensile stress in pile and extent/location of any pile damage caused by the initial driving. With each blow of the pile,

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record the information listed below electronically and analyze the information using the Pile Driving Analyzer:

- a. Blow number
- b. Blow rate per minute and stroke.
- c. Input and reflected values of force and velocity.
- d. Value of upward and downward traveling force wave with time.
- e. Maximum and final transferred energy to pile, hammer system efficiency.
- f. Maximum compressive stress, velocity, acceleration and displacement.
- g. Maximum tensile stress in pile.
- h. Pile structural integrity, damage detection, extent and location.
- i. Bearing capacity of pile by Case method.

If the pile, hammer and soil performance evaluation recommends changes to the hammer stroke, pile cushioning, augering or any other aspect for the pile driving operation, incorporate these changes into production pile driving in an effort to control excessive stresses and pile damage. Replace test piles damaged or broken during installation, incorporating driving modifications as determined by the Contractor's Geotechnical Consultant and reviewed and approved by the Contracting Officer. Repeat this procedure until allowable tensile and compressive stresses are achieved in the pile and pile damage is minimized. Subject selected initial driving records to rigorous computer analysis by the Case Pile Wave Analysis Program (CAPWAP) for determination of resistance distribution, soil resistance and properties, and estimation of anticipated gain/loss factor

- 3) CAPWAP - Signal matching analysis by CAPWAP software of the dynamic pile testing data must be performed on data obtained from the end of initial driving and the beginning of restrike of all control piles. CAPWAP analyses must be performed by an engineer who has achieved Advanced Level or better on the PDI / PDCA Dynamic Measurement and Analysis Proficiency Test for Providers of PDA Testing Services. Upon completion of test pile driving, allow the piles to set-up for at least 72 hours. After evaluation of pile, hammer and soil performance by the Contractor's Geotechnical Consultant, the second step of the dynamic pile analysis may proceed. This portion of the evaluation requires striking the set-up piles a minimum of 20-50 times, or as directed by the Contractor's Geotechnical Consultant using the same hammer which was used for the test pile driving and which will be used for production pile driving. "Warm up" the hammer and make it optimally ready prior to restriking, in order to avoid capacity losses during evaluation of restrike data. Apply maximum hammer energy during restrike in order to fully mobilize the soil resistance. However, exercise care so as to not overstress the pile. In addition to those items listed above, selected restrike driving records (as directed by the Contractor's Geotechnical Consultant) are to be subjected to rigorous computer analysis by the Case Pile Wave Analysis Program (CAPWAP) for determination of resistance distribution, soil resistance and properties, and plot of applied load vs. average pile displacement based on the calculated soil properties.
- 4) Dynamic Load Test Reporting - Upon satisfactory completion of each dynamic load test, submit a Pile Performance Report for the Contractor by the Contractor's Geotechnical Consultant. The submittal must be prepared and sealed by a Professional Engineer registered in North Carolina.

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The report for the Dynamic Pile Analysis must contain the following information:

- Capacity of pile from Case Pile Wave Analysis Program (CAPWAP). Information resulting from analysis of a selected restrike blow.
- Maximum and final transferred energy, hammer system efficiency during pile installation.
- Maximum compressive stress, velocity, acceleration and displacement.
- Maximum tensile stress in pile.
- Pile structural integrity, damage detection, extent and location.
- Blows per minute and blow number.
- Input and reflection values of force and velocity, upward and downward traveling force wave with time.
- Pile skin friction and toe resistance distribution.
- Maximum energy transferred to pile

The maximum allowable pile design load must be proposed by the Contractor's Geotechnical Consultant based upon the results of a satisfactory pile load test conducted on a pile driven as specified herein and must include the effects of load transfer to the soil above the foundation stratum.

Use either a model Model 8G or PAX Pile Driving Analyzer as manufactured by Pile Dynamics, Inc., of Cleveland Ohio or approved equivalent, for dynamic testing of the pile hammer and for dynamic load testing of the test pile. All equipment necessary for the dynamic monitoring such as sensors, cables or wireless transmitters, must be furnished by the Contractor's Geotechnical Consultant. The equipment must conform to the requirements of ASTM D4945.

Pay for all services of the Contractor's Geotechnical Consultant. The Contractor's Geotechnical Consultant must be available throughout the pile driving operation to consult with the County Project Manager when required by the County Project Manager. The cost of changes in the Contractor's procedure, as required by evaluation of the results of the Pile Driving Analysis, will be at the Contractor's expense.

- C. Test Pile-Driving Records: Prepare driving records for each test pile. Include same data as required for driving records of permanent piles.
- D. Test piles that comply with requirements, including location tolerances, may be used on Project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent breaks, cuts, abrasions, or other physical damage and as required by AWP4 M4.

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1. Do not drill holes or drive spikes or nails into pile below cutoff elevation.

1.10 FIELD CONDITIONS

- A. Protect structures, underground utilities, and other construction from damage caused by pile driving.
- B. Site Information: A geotechnical report has been prepared for this Project and is **[included]** **[referenced]** elsewhere in the Project Manual for information only.
- C. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Document conditions that might be misconstrued as damage caused by pile driving. Comply with Section 013233 "Photographic Documentation."

PART 2 - PRODUCTS

2.1 TIMBER PILES

- A. Round Timber Piles: ASTM D25, unused, clean peeled, one piece from butt to tip; of the following species and size basis:
 1. Species: Southern yellow pine.
 2. Size Basis: 8-inch (203-mm) tip and natural taper.
- B. Pressure-treat round timber piles according to AWPA U1 as follows:
 1. Service Condition: UC4C Ground Contact, Extreme Duty
 2. Treatment: Dual treatment consisting of waterborne preservative, followed by creosote or creosote solution.

2.2 PILE ACCESSORIES

- A. Driving Shoes: Fabricate from ASTM A1011/A1011M, hot-rolled carbon-steel strip to suit pile-tip diameter, of the following type and thickness, and secure to pile tip so as to not affect pile alignment during driving:
 1. Type: Contractor's option. Submit Pile accessories for review prior to construction..
 - 2.

2.3 FABRICATION

- A. Pile Tips: Cut and shape pile tips to accept driving shoes. Fit and fasten driving shoes to pile tips according to manufacturer's written instructions.
- B. Pile Butt: Trim pile butt and cut perpendicular to longitudinal axis of pile. Chamfer and shape butt to fit tightly to driving cap of hammer.

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- C. Field-Applied Wood Preservative: Treat field cuts, holes, and other penetrations according to AWP4 M4.
 - 1. Coal-tar roofing cement for treating drilled holes or sealing cutoffs shall be free of asbestos.
- D. Pile Splices: Splices are not permitted.
- E. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch (305-mm) intervals; label the distance from pile tip at 60-inch (1524-mm) intervals. Maintain markings on piles until driven.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches (152 to 305 mm) above bottom of footing or pile cap.

3.2 PRELIMINARY WORK

- A. Installation Drawings: Submit pile installation drawings at least 28 calendar days prior to installation. Drawings must indicate individual pile numbers, sequencing, and any phasing or special installation considerations.
- B. Wave Equation Analysis of Pile Drivability
 - 1. Prior to driving any pile, submit a pile Wave Equation Analysis, performed by Contractor's Geotechnical Consultant, for each size pile and distinct subsurface profile condition. These analyses must take into account the proposed hammer assembly, pile capblock and cushion characteristics, the pile properties and estimated lengths and the soil properties anticipated to be encountered throughout the installed pile length based on static capacity analysis with consideration of driving gain/loss factors. Only one specific model of pile hammer may be used for each pile type and capacity.
 - 2. Demonstrate using the Wave Equation Analysis that the piles will not be damaged during driving, indicate that the driving stresses will be maintained within the limits below and indicate the blow count necessary to achieve the required ultimate static pile capacities.
 - 3. Perform a refined Wave Equation Analysis upon completion of the dynamic and static testing programs outlined in this specification section, taking into consideration the evaluated capacities, gain/loss factors and recommended production pile lengths.
 - 4. All pile driving equipment provided by the Contractor will be subject to the approval of the Contractor's Geotechnical Consultant. Complete the attached pile and driving equipment data form, including hammer information, in full as part of the submittal of the results of the Wave Equation Analyses.

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5. Pay for the cost of performing the Wave Equation Analyses and include in the base bid

3.3 DRIVING EQUIPMENT

- A. **Pile Hammer:** Provide a hammer capable of developing the indicated ultimate pile capacity at blow count less than 100 per foot considering hammer impact velocity; ram weight; stiffness of hammer and pile cushions; cross section, length, and total weight of pile; and character of subsurface material to be encountered. Use the same pile hammer, operating at the same rate and in the same manner, as that used for driving test piles. Use wave equation analysis to verify that the hammer will develop stresses within acceptable limits in the piles. At final driving, operate pile hammer in accordance with manufacturer's recommendation. Provide the plant and equipment for air hammers that have sufficient capacity to maintain, under working conditions, the pressure at the hammer specified by the manufacturer. The hose connecting the compressor with the hammer must be at least the minimum size recommended by the Manufacturer. Evaluate hammer performance at the end of driving by measuring blows per minute and comparing with the manufacturer's recommendations. Measure impact velocity of open-end (single acting) diesel hammers at all times during pile driving operations with a device for this purpose. If such a device is not available, obtain the stroke by measuring the speed of operation either manually or with a device that makes the measurement automatically. Equip closed-end (double acting) diesel hammers with a bounce chamber pressure gauge in good working order, mounted near ground level so as to be easily read by the County Project Manager. Provide a correlation chart of bounce chamber pressure and potential energy. Equip hydraulic hammers with a system for measurement of ram energy. The system must be in good working order and the results must be easily and immediately available to the County Project Manager.
- B. **Driving Helmets or Pile Cushions:** Use a steel driving helmet or pile cushion between top of pile and driving helmet or cap to prevent impact damage to pile. Use a driving helmet or pile cushion combination capable of protecting pile head, minimizing energy absorption and dissipation, and transmitting hammer energy uniformly over top of pile. Provide driving helmet that fits sufficiently loose around top of pile so that pile may be free to rotate without binding within driving helmet. Use pile cushion of solid wood or of laminated construction using plywood, softwood or hardwood boards with grain parallel to end of pile. Select the pile cushion thickness placed on the pile head prior to driving by wave equation analysis so that the limiting driving stresses are not exceeded. Replace pile cushion at the start of driving of each pile and when it becomes highly compressed, charred or burned, or has become spongy or deteriorated in any manner. Show details of driving helmets, and pile cushions. Submit 2 weeks prior to test pile installation.
- C. **Hammer Cushion:** Use a hammer cushion between driving helmet or cap and hammer ram consisting of a solid hardwood block with grain parallel to the pile axis and enclosed in a close-fitting steel housing or aluminum and micarta (or equal) discs stacked alternately in a steel housing or a suitable polymer designed for this specific purpose as indicated by the hammer manufacturer. Use steel plates at top and bottom of hammer cushion. Replace hammer cushion when it becomes highly compressed, charred or burned or becomes spongy or deteriorated in any manner. Replace aluminum, micarta or polymer discs that have become damaged, split or deteriorated in any manner. Do not use small wood blocks, wood chips, rope or other materials that permit excessive loss of hammer energy.

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If the cushion is other than that specified above, submit to the County Project Engineer at least 2 weeks prior to the commencement of test pile driving, detailed drawings and records of previous successful use. Generally, follow the pile hammer manufacturer's recommendations with respect to hammer cushions

- D. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that hold the full length of pile firmly in position and in axial alignment with hammer.

3.4 DRIVING PILES

- A. General: Continuously drive piles to elevations or penetration resistance indicated or established by dynamic load testing of piles. Establish and maintain axial alignment of leads and piles before and during driving.
- B. Spudding: Drive spud piles through overlying highly resistant strata or obstructions and withdraw for reuse.
- C. Predrilling: Provide pre-excavated holes where indicated, to depths indicated. Drill holes with a diameter less than the largest cross-section dimension of pile.
 - 1. Firmly seat pile in predrilled hole by driving with reduced energy before starting final driving.
- D. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.
- E. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:
 - 1. Location: 4 inches (102 mm) from location indicated after initial driving, and 6 inches (152 mm) after pile driving is completed.
 - 2. Plumb: Maintain 1 inch (25 mm) in 48 inches (1219 mm) from vertical, or a maximum of 4 inches (102 mm), measured when pile is aboveground in leads.
 - 3. Batter Angle: Maximum 1 inch (25 mm) in 48 inches (1219 mm) from required angle, measured when pile is aboveground in leads.
- F. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.
 - 1. Fill holes left by withdrawn piles using cohesionless soil material such as gravel, broken stone, and gravel-sand mixtures. Place and compact in lifts not exceeding 72 inches (1830 mm).
 - 2. Fill holes left by withdrawn piles as directed by Architect.
- G. Abandon and cut off rejected piles as directed by Architect. Leave rejected piles in place and install new piles in locations as directed by Architect.
- H. Cut off butts of driven piles square with pile axis and at elevations indicated.

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1. Cover cut-off piling surfaces with minimum three coats of preservative treatment according to AWP A M4.
- I. Pile-Driving Records: Maintain accurate driving records for each pile. Include the following data:
 1. Project name and number.
 2. Name of Contractor.
 3. Pile species.
 4. Pile location in pile group and designation of pile group.
 5. Sequence of driving in pile group.
 6. Pile dimensions.
 7. Ground elevation.
 8. Elevation of tips after driving.
 9. Final tip and cutoff elevations of piles after driving pile group.
 10. Records of re-driving.
 11. Elevation of splices.
 12. Type, make, model, and rated energy of hammer.
 13. Weight and stroke of hammer.
 14. Type of pile-driving cap used.
 15. Cushion material and thickness.
 16. Actual stroke and blow rate of hammer.
 17. Pile-driving start and finish times, and total driving time.
 18. Time, pile-tip elevation, and reason for interruptions.
 19. Number of blows for every 12 inches (305 mm) of penetration, and number of blows per 1 inch (25 mm) for the last 6 inches (152 mm) of driving.
 20. Pile deviations from location and plumb.
 21. Preboring, jetting, or special procedures used.
 22. Unusual occurrences during pile driving.
- J. Certified Piles Survey: Engage a land surveyor to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.
 1. Notify Architect when deviations from locations exceed allowable tolerances.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Pile foundations.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:
 1. Dynamic Pile Testing: High-strain dynamic monitoring shall be performed and reported according to ASTM D4945 during initial driving and during restriking on [seven single piles.

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3.6 DISPOSAL

- A. Remove withdrawn piles and cutoff sections of piles from site and legally dispose of them off Owner's property.

END OF SECTION 31 62 19

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
 - 3. Pavement-marking paint.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
 - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Qualification Data: For qualified manufacturer and Installer.
- C. Material Certificates: For each paving material, from manufacturer.
- D. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by North Carolina Department of Transportation (NCDOT). Plants used for the preparation of bituminous mixtures shall conform to all requirements of NCDOT Standard Specifications for

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Roads and Structures (SSRS) Subarticle 610-5(B). In addition, batch mixing plants shall also conform to Subarticle 610-5(C), continuous mixing plants shall also conform to Subarticle 610-5(D), and drum mixing plants shall also conform to Subarticle 610-5(E).

- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of standard specifications of NCDOT for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.
- C. Transportation of bituminous mixture from the mixing plant to the site shall be in trucks having tight, clean, smooth, lightly oiled beds. The Engineer may require each load to be covered with canvas or other suitable material of ample size to protect the mix from the weather and prevent the loss of heat. Deliveries shall be made such that spreading and rolling of all mixture prepared during a day's run can be completed during daylight, unless artificial light satisfactory to the Engineer is provided. The mixture shall be delivered to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will not be less than hereinafter specified.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

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1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.
 6. Or as allowed by NCDOT.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials, and not exceeding 95 deg F (35 deg C).

1.8 PROTECTION OF THE WORK

- A. Protection from damage: The Contractor shall adequately and fully protect all parts of the work against damage until completed and accepted by the Owner. Damages shall be properly repaired by the Contractor at no additional expense to the Owner.
- B. Temporary Barricades: Throughout the duration of the Contract, the Contractor shall provide temporary barricades, conforming with the latest edition of U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices for Streets and Highways," properly lighted, to keep traffic off the current portion of the work.
- C. Protection of adjacent surfaces: The Contractor shall protect exposed surfaces adjacent to the work from physical damage resulting from construction activities, and from becoming stained during application of paving materials. The Contractor shall clean, repair, or replace, as required, surfaces damaged during the course of the work at no additional expense to the Owner.
- D. Protection from Graffiti: Newly paved roads, streets, curbs, or sidewalks shall be protected AND guarded from graffiti from passersby until the asphalt has sufficiently cured to resist such molestation. Failure to prevent graffiti, or other such vandalism, shall result in the new asphalt having to be removed and replaced. This requirement shall mandate the Contractor to take the necessary steps in preventing such incidents including, but not limited, to guarding the project after normal working hours.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

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- C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 in accordance with NCDOT section 1020.
- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material and ASTM D 946 for penetration-graded material.
- C. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- D. Water: Potable.
- E. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA, USDA, and NC Department of Agriculture. Provide in granular, liquid, or wettable powder form.
 - 1. Use of herbicide shall be limited to the roadway subgrade and stone base.
- B. Sand: AASHTO M 29, Grade Nos. 2 or 3.
- C. Joint Sealant: ASTM D 6690 Type III, hot-applied, single-component, polymer-modified bituminous sealant.
- D. Pavement-Marking Paint (Outside public right-of-way): Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952. All pavement marking shall be in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways," U.S. DOT.
 - 1. Color: White – NCDOT color 17886.
 - 2. Color: Yellow – NCDOT color 13538.
- E. Pavement-Marking Paint (Inside public right-of-way): Thermo-plastic, comply with NCDOT Standards Section 1205.
 - 1. Color: White – NCDOT color 17886.
 - 2. Color: Yellow – NCDOT color 13538.

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2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base, surface course or mix as indicated on drawings.

2.5 EQUIPMENT

- A. Paver
 - 1. Paver shall be a self-contained, self-propelled paver specifically designed for uniform placement of bituminous mixtures with fully activated screed plate. The screed plate shall be of adequate length to spread and finish the full uniform travel lane width being placed and also equipped to be pre-heated for the full length of the screed when necessary.
- B. Self-Propelled Tandem Steel Wheeled Roller
 - 1. Tandem steel wheeled roller shall be self-propelled, weigh not less than ten (10) tons at any time, and have a minimum weight of two hundred (200) pounds per inch width of wheel weight. The wheels shall be equipped with adjustable scrapers and sprayers.
- C. Self-Propelled Pneumatic Tired Roller
 - 1. Pneumatic tired rollers shall be self-propelled, weigh not less than eight (8) tons at any time, have not less than seven (7) pneumatic tires with equal tire pressure of sixty to ninety (60-90) PSI, and have a minimum weight of two hundred (200) pounds per inch width of wheel weight. The wheels shall be equipped with adjustable scrapers and sprayers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h), or 300 feet per minute.

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2. Proof roll subgrade and base course with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons. Truck shall be sufficiently loaded with ballast to provide a minimum weight of (30) tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 MANHOLE AND VALVE BOX ADJUSTMENT

- A. All existing manholes and valve boxes shall be adjusted to grade in accordance with this Section prior to placement of pavement surface course.
- B. Contractor shall protect and reuse existing castings where possible. It shall be the Contractor's responsibility to show prior damage of castings to Architect at earliest possible opportunity.

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Castings damaged during or due to construction activities shall be the responsibility of the Contractor, and said castings shall be replaced by the Contractor at no cost to the Owner.

- C. Roadway boxes for water valves, gas valves, water blowoffs, sewer cleanouts, monitoring wells, locator wires, etc., shall be adjusted using telescopic adjustment feature of box where possible. An adequate area around the box (2' by 2' min.) shall be removed for adjustment of box and backfilling. Where adjustment with telescopic feature is not adequate, the box shall be completely removed and reset to proposed grade using concrete setting blocks and #57 stone to subgrade elevation. Excavation for box adjustment shall be backfilled with #57 stone or CABC to a maximum of six (6") inch area below the surface course shall be filled with Class A portland cement concrete or Type B25.0B binder.
- D. Masonry manholes shall be removed to a sufficient depth to provide for adjustment, and the adjustment shall be made with masonry brick and mortar with a ½" min. parge coat of mortar placed over the masonry inside and out. Masonry steps shall be maintained consistent with existing spacing. Excavation for manhole adjustment shall be backfilled with #57 stone or CABC to a maximum of (6") inches below the bottom of the surface course. The area below the surface course shall be filled with Class A portland cement concrete or Type B25.0B binder.
- E. Precast manholes may be adjusted with masonry brick, mortar, and parge coat as with masonry manholes or Contractor may opt for replacement of existing cone riser with an eccentric cone riser or addition of an interlocking precast reinforced concrete grade ring. Cone risers and adjusting grade rings shall be manufactured in accordance with ASTM C-478, latest edition. Excavation for manhole adjustment shall be backfilled with #57 stone or CABC to a maximum of six (6") inches below the bottom of the surface course. The area below the surface course shall be filled with Class A portland cement concrete or Type B25.0B binder.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
 - 3. All areas where pavement courses will be placed against castings or gutter edges shall also be coated with tack.

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3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated on drawings.
 - 2. Place hot-mix asphalt surface course in single lift unless indicated otherwise on drawings.
 - 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

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1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct lay down and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Comply with NCDOT range of acceptable densities per Superpave Gyratory Compactor test method.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 1/2 inch (13 mm).
 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 1. Base Course: 1/4 inch (6 mm).
 2. Surface Course: 1/8 inch (3 mm).
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

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- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections. Cost will be billed to the construction testing allowance. See bid form. Notify Architect two days in advance of testing.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
- G. Smoothness Test
 - 1. Location of smoothness testing shall be at random locations specified by the Architect. Contractor shall be responsible for supplying two competent workers to assist Architect or his appointed representative in testing.
 - 2. The top surface of the in place and compacted pavement shall not show any deviations in excess of one-quarter (1/4") inch when tested with a ten (10') foot straight-edge applied with and at right angle to the centerline of the roadway.

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3. Any deviation in excess of the above amount shall be corrected by the Contractor by heating, shaping, milling, resurfacing, or removal and replacement as necessary at no additional expense to the Owner.

3.12 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16

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SECTION 32 12 17 - ASPHALT PAVEMENT TEXTURING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Asphalt pavement texturing is a highly suitable solution for a wide variety of decorative pavement applications. Paved entranceways, parking lots, residential driveways, sidewalks, plazas, medians, and cross-walks are some examples of successful applications of asphalt pavement texturing.
- B. Asphalt pavement texturing is executed by elevating the temperature of an asphalt pavement surface and then pressing a metal template into the surface to replicate, in relief, the grout depressions common to hand-laid brick or cobblestone, or any other design as shown on the drawings or described in the specifications. The imprinted asphalt pavement surface is then coated with a coating or system of coatings specifically formulated for asphalt pavement.
- C. Asphalt pavement texturing is a highly specialized process that requires the skill of a qualified applicator working with the proper equipment and applying highly specialized coating(s) designed specifically for application to asphalt pavement.
- D. This specification will include guidance with respect to the minimum requirements/qualifications of the applicator, equipment and coating in the execution of this Work.

1.2 REFERENCES

- A. ASTM D-4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Tester.
- B. ASTM D-4060 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- C. ASTM D522-93A Standard Test Method for Mandrel Bend Test of Attached Organic Coatings.
- D. ASTM G-155 QUV Accelerated Weathering Environment. Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
- E. ASTM D-2486 MEK rub test for chemical resistance.
- F. ASTM E-303 British Pendulum test for friction.
- G. EPA 24 ASTM D3960-05 Volatile Organic Compounds.

1.3 DEFINITIONS

- A. “Qualified Applicator” is a contractor or applicator who has completed asphalt pavement texturing work and can provide certification and references upon request.

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- B. “Owner” means the Owner and refers to the representative person who has decision making authority for the Work.
- C. “Textured asphalt Pavement” is asphalt pavement that has been subjected to imprinting or stamping in a specific pattern.
- D. “Non-textured asphalt pavement” is asphalt pavement that is unstamped and is sometimes referred to as “flatwork”.
- E. The “Work” is the asphalt pavement texturing work contemplated in this bid submission and specification.
- F. “Scuffing” is a “tear” of the asphalt pavement caused by an external force. Stationary vehicle tires turning on the pavement surface is a typical cause.

1.4 SUBMITTALS

The documents required as part of this bid submission are as follows:

- A. Proof of applicator’s ability. A copy of the current year license as provided to the proposed applicator issued by a recognized authority in the execution of asphalt pavement texturing work. Failing that, at least 3 reference sites and written references from 3 previous customers for work performed by this applicator.
- B. A list of the major equipment to be used in the execution of the Work. This list will include the asphalt pavement reheat machinery, spray equipment, compactor(s) and templates.
- C. The name of the coating(s) and the coating supplier’s name.
- D. Certified performance test results of the coating materials as outlined in Table 1.
- E. Confirmation of coating color(s).

PART 2 – PRODUCTS

2.1 MATERIALS – COATINGS

Properly designed asphalt pavement coatings have been scientifically formulated to provide the optimal balance of performance properties for a durable, long lasting color and texture to asphalt pavement surfaces. Some of these key properties include wet wear durability, crack resistance, fade resistance, adhesion, and friction properties. These properties must be backed up by a Certificate of Analysis from an independent laboratory or an equal document that certifies these performance properties.

The asphalt pavement coating must be environmentally safe and meet EPA requirements for Volatile Organic Compounds (VOC).

Only use asphalt pavement coatings from qualified pavement coating suppliers who can provide proof of these required performance properties.

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2.2 MINIMUM PERFORMANCE PROPERTIES OF ASPHALT COATING

The following table outlines the minimum required performance properties of the asphalt pavement coating. These performance properties must be ascertained by a Certificate of Analysis issued by an approved testing facility.

TABLE 1: Required Performance Properties of Asphalt Pavement Coating

Characteristic	Test Specification	Minimum Required Result
Durability Taber Abrasion (cycles to wear-through)	ASTM D-4060 Abrasion Resistance of Organic Coatings (wet wear) 7 day cure, 24 hour soak;H-10 wheel	Wear Index (WI) < 5.0
Color stability	ASTM G-155 QUV 2,000 hours (CIE units)	Brick color $\Delta E < 1.5$
Flexibility: Mandrel Bend	ASTM D522-93A Flexibility as measured by Mandrel bend 0.5mm thick sample passes 10 mm at 21°C 0.5mm thick sample passes 125mm at -18°C	
Chemical resistance	ASTM D-2486 Modified MEK scrubs 16 dry mils, number of scrubs until 50% substrate exposed	>5000
Adhesion to Asphalt	ASTM D-4541	Substrate Failure
Friction Wet	ASTM E-303 British Pendulum Tester	>55
Environmental Sensitivity	EPA 24 ASTM D3960-05 Volatile Organic Compounds	VOC < 150

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2.3 EQUIPMENT

The following specialized equipment shall be used in the execution of the Work.

- A. Metal wire rope templates are used to create the desired imprint pattern. Only use templates that have been supplied by a manufacturer who has the proven expertise in manufacturing these templates for this type of application.
- B. Asphalt pavement reheat equipment specifically designed for asphalt pavement texturing is to be used in the execution of this work. The primary asphalt pavement re-heat equipment must cycle the heat application and must allow the equipment operator to check the pavement surface temperature during the heating process. These controls are necessary to enable the pavement temperature to be elevated gradually, giving the operator the ability to ensure that the pavement is not overheated or adversely affected. Heaters without these controls are strictly prohibited as the primary re-heat equipment.
- C. Hand-held portable heating devices may be used only for areas where it is difficult to operate the re-heat machine. These may not be used as the primary pavement re-heating device.
- D. Finishing tools that are designed to enable the applicator to complete the imprinting of the asphalt pavement in areas which may be inaccessible to the template such as curbs and manhole covers are permitted.
- E. Vibratory Plate Compactors shall be used for pressing the templates into the heated asphalt pavement to create the specified pattern.
- F. Specialized coating spray equipment must be used in the application of the coating and must be capable of applying the coating to the asphalt pavement surface in a thin, controlled film which will optimize the drying and curing time of the coating. More specifically, the spray equipment pump must be capable of providing a continuous recirculation of the coating in order to keep the solids within the coating in suspension.

PART 3 - EXECUTION

3.1 GENERAL

The pavement texturing system shall be supplied and installed by a Qualified Applicator in accordance with the plans and specifications or as directed by the Owner. Do not begin the Work until confirmation of the Applicator's qualifications is provided.

3.2 PRE-CONDITIONS – ASPHALT PAVEMENT

A highly stable asphalt pavement free of defects is a pre-requisite for the installation of a pavement texturing system. Do not install the pavement texturing system over poor quality asphalt pavement.

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3.2.1 Pre-requisites for new asphalt pavement

A durable and stable asphalt pavement mix design installed according to best practices over a properly prepared and stable substrate is a pre-requisite for all long-lasting asphalt pavement surfaces. The application of a pavement texturing system does not change this requirement.

Generally, the asphalt pavement mix design for roadways as prescribed by the local jurisdiction will be sufficient for the application of a pavement texturing system.

3.2.2 Pre-requisites for existing asphalt pavement

Depending upon the condition and age, existing asphalt pavement may or may not be suitable for the successful application of a pavement texturing system. Minimally, the asphalt pavement must be in excellent condition and not have any defects including cracks, ruts or potholes nor demonstrate any flushing, raveling or like deficiencies.

3.2.3 Pavement Marking Removal: recommended guidelines

Pavement markings may be removed by sandblasting, water-blasting, grinding, or other approved mechanical methods. The removal methods should, to the fullest extent possible, cause no significant damage to the pavement surface. The Owner shall determine if the removal of the markings is satisfactory for the application of the pavement texturing system. Work shall not proceed until this approval is granted.

3.2.4 Surface Preparation

The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

3.3 LAYOUT

Layout of the pattern for imprinting into the surface of the asphalt pavement shall be as per the drawings and specifications.

3.4 HEATING THE ASPHALT PAVEMENT

The Applicator shall use asphalt pavement reheat equipment as described in Section 2.3.

- A. The optimal pavement temperature for imprinting the template is dependent upon mix design, modifiers used in the mix, the age of the pavement and weather. The surface temperature of the pavement should not exceed 325°F as determined by an infra-red thermometer reading taken after the heat is applied to the asphalt pavement.
- B. In order to achieve the proper depth of imprint it is important to elevate the asphalt pavement temperature to a minimum depth of 1/2 inch (12.5mm) without burning the pavement surface. This can only be accomplished using asphalt pavement reheat equipment that is specifically designed for this Work.

3.5 SURFACE IMPRINTING

- A. The pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

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- B. Once the asphalt pavement has reached imprinting temperature, the templates shall be placed in position and pressed into the surface using vibratory plate compactors. The top of the template is to be flush with the surrounding asphalt pavement and can then be removed. Areas that have an imprint depth less than 3/8 inch shall be re-heated and re-stamped prior to applying the coatings. Hand tooling is a permitted method to achieve proper imprint depth in areas difficult to get at with the template.

3.6 APPLICATION OF ASPHALT PAVEMENT COATING

3.6.1 Application Guidelines.

- A. The qualified applicator shall refer to the asphalt pavement coating supplier's recommendations for methods of application. Special care and attention must be paid to ensure asphalt pavement coatings are applied in environmental conditions that permit proper cure.
- B. The coating application shall proceed as soon as possible upon completion of the imprinting of the asphalt pavement.
- C. The pavement surface shall be completely dry and thoroughly cleaned prior to application of the asphalt pavement coating(s).
- D. Depending upon the condition and age of the pre-existing pavement, primer may be required. Refer to the asphalt pavement coating supplier's specifications.
- E. The qualified applicator shall use spray equipment specifically designed for the application of the coating(s) as outlined in Section 2.3 above.
- F. Refer to the asphalt pavement coating supplier's recommendations for coating coverage rate, number of recommended passes and recommended film thickness.

3.7 OPENING TO TRAFFIC

Minimally, the surface coating must be 100% dry before traffic is permitted. Refer to the asphalt pavement coating supplier's guide.

END OF SECTION 32 12 17

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SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Parking lots.
 - 2. Curbs and gutters.
 - 3. Walkways
- B. Related Sections include the following:
 - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
 - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

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 Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For testing agency.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

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- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- F. Field quality-control test reports.
- G. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who 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."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Obtain Architect's approval of mockups before starting construction.
 - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 - 5. Demolish and remove approved mockups from the site when directed by Architect.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete producer.
 - d. Concrete pavement 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 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.
 - 2. Use forms free from warp and of sufficient strength when staked to hold the specified alignment during concrete placing and finishing operations.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

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- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- 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, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type I gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Do not use fine or coarse aggregates that contain substances that cause spalling.
 - 4. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

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6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
 1. [Available]Products:
 - a. Monofilament Fibers:
 - 1) Axim Concrete Technologies; Fibrasol IIP.
 - 2) Euclid Chemical Company (The); Fiberstrand 100.
 - 3) FORTA Corporation; Forta Mono.
 - 4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.
 - 6) SI Concrete Systems; Fibermix Stealth.
 - 7) Or product equal to the above.
 - b. Fibrillated Fibers:
 - 1) Axim Concrete Technologies; Fibrasol F.
 - 2) FORTA Corporation; Forta.
 - 3) Euclid Chemical Company (The); Fiberstrand F.
 - 4) Grace, W. R. & Co.--Conn.; Grace Fibers.
 - 5) SI Concrete Systems; Fibermesh.
 - 6) Or product equal to the above.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
 1. Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edeco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.

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- g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, ChemRex Inc.; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation; Finishing Aid.
 - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
 - q. Or product equal to the above.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoko; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation; Resi-Chem Clear.
 - m. Tamms Industries Inc.; Horncure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
 - p. Or product equal to the above.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
 - b. Burke by Edoco; Resin Emulsion White.
 - c. ChemMasters; Safe-Cure 2000.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
 - f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
 - g. Kaufman Products, Inc.; Thinfilm 450.
 - h. Lambert Corporation; Aqua Kure-White.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
 - j. Meadows, W. R., Inc.; 1200-White.
 - k. Symons Corporation; Resi-Chem White.
 - l. Tamms Industries, Inc.; Horncure 200-W.
 - m. Unitex; Hydro White.
 - n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

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- o. Or product equal to the above.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N.

2.9 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 3000 psi (20.7 MPa).
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, plasticizing and retarding 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.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.

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3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M[and ASTM C 1116]. Furnish batch certificates for each batch discharged and used in the Work.
 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

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 pavements with heavy pneumatic-tired equipment 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 (5 km/h).
 2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/4 inch (6 mm) require correction according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.

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3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement 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. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form-release agent 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.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings 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 pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.
 - 3. Butt Joints: Use 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 1-1/2 inches (38 mm) into concrete.

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5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat 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, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) 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. Protect top edge of joint filler during concrete placement 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. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:
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 (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and 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.

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- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. 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.
- H. 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.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. 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.
- L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- O. 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 air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture

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temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) 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. 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.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.
4. Final Tooling: Toll edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - a. Radius: ¼ inch.

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.

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- 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 (1 kg/sq. m 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: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moist 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 (300-mm) 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 (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch (6 mm).
 - 2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
 - 3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm). (assuming no ponded water)
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
 - 8. Joint Spacing: 3 inches (75 mm).
 - 9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
 - 10. Joint Width: Plus 1/8 inch (3 mm), no minus.
 - 11. Contractor will be required to remove and replace sidewalk constructed without positive drainage (i.e. bird baths) at contractor's expense.

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3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking, except as indicated by paint manufacturer.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Cost for the work will be billed against the geotechnical testing allowance with approval from the Architect.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Testing will be conducted randomly as directed by Architect.
 - 2. Slump: ASTM C 143/C 143M; testing will be conducted randomly as directed by Architect.
 - 3. Air Content: ASTM C 231, pressure method; testing will be conducted randomly as directed by Architect.
 - 4. Concrete Temperature: ASTM C 1064; testing will be conducted randomly as directed by Architect.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 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 (3.4 MPa).
- D. 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.

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- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Protection from damage: The Contractor shall adequately and fully protect all parts of the work against damage until completed and accepted by the Owner for maintenance. Damages shall be properly repaired by the Contractor at no additional expense to the Owner.
- E. Temporary barricades: Throughout the duration of the Contract, the Contractor shall provide temporary barricades, conforming with the latest edition of U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices for Streets and Highways," properly lighted, to keep traffic off the current portion of the work.
- F. Protection of adjacent surfaces: The Contractor shall protect exposed surfaces to the work from physical damage resulting from construction activities, and from becoming stained during application of paving materials. The Contractor shall clean, repair, or replace, as required, surfaces damaged during the course of the work at no additional expense to the Owner.
- G. Protection from graffiti: Newly poured concrete roads, streets, curbs, or sidewalks shall be protected AND guarded from graffiti from passersby until the concrete has sufficiently cured to resist such molestation. Failure to prevent graffiti, or other such vandalism, shall result in the new concrete having to be removed and replaced. This requirement shall mandate the Contractor to take the necessary steps in preventing such incidents including, but not limited, to guarding the project after normal working hours.
- H. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

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SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

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. Cold-applied joint sealants.
 - 2. Hot-applied joint sealants.

- B. Related Sections:

- 1. Division 07 Section "Joint Sealants" for sealing non-traffic and traffic joints in locations not specified in this Section.
 - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 PRECONSTRUCTION TESTING

- 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 manufacturer's standard test method 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 no fewer than eight pieces of each type 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 compatibility with and adhesion to joint substrates and other materials matching those submitted.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

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- B. Samples for Verification: For each kind 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. Pavement-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.
- D. Qualification Data: For qualified Installer.
- E. Product Certificates: For each type of joint sealant and accessory, from manufacturer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.
- G. Preconstruction Compatibility and Adhesion Test Reports: From joint-sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility with and adhesion to joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Preinstallation Conference: Conduct conference at Project site.

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 or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

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4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafcro Inc., an ERGON company; RoadSaver Silicone SL.
 - b. Dow Corning Corporation; 890-SL.
 - c. Pecora Corporation; 300 SL.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafcro Inc., an ERGON company; Superseal 444/777.
 - b. W.R. Meadows Sealtight; #1190

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

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- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

- A. Primers: Product 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or 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.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-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 joint-sealant backings of kind indicated to support joint 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 joint-sealant backings.

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2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place joint sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess joint 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 Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVEMENT-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within cement concrete pavement.
1. Joint Location:
 - a. Expansion and isolation joints in cast-in-place concrete pavement.
 - b. Contraction joints in cast-in-place concrete slabs.
 - c. Other joints as indicated.

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2. Silicone Joint Sealant for Concrete: Single component, self-leveling.
3. Hot-Applied Joint Sealant for Concrete: Single component.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 321373

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SECTION 32 14 00 - UNIT PAVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Brick pavers set in aggregate setting bed.
 - 2. Brick pavers set in mortar setting bed.
 - 3. Stone pavers set in aggregate and mortar setting bed.
 - 4. Polymeric sand
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for compacted subgrade and subbase course, under unit pavers.
 - 2. Division 2 Section "Cement Concrete Pavement" for concrete base course under unit pavers and concrete band.
 - 3. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit pavers with elastomeric sealants.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Brick pavers.
 - 2. Granite pavers.
 - 3. Polymeric sand
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of unit paver indicated.
 - 1. Include similar Samples of material for joints and accessories involving color selection.
- C. Samples for Verification: Full-size units of each type of unit paver indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. Provide Samples with joints grouted and cured, showing the full range of colors to be expected in the completed Work.

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- D. 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.
- E. Compatibility and Adhesion Test Reports: From latex-additive manufacturer indicating the following:
 - 1. Mortar and grout containing latex additives have been tested with pavers for compatibility and adhesion.
 - 2. Interpretation of test results relative to mortar and grout performance and written recommendations for installation practices needed for adhesion.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to latex-additive manufacturer, for testing indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.
 - 1. Use manufacturer's standard test methods to determine whether mortar and grout materials are required to obtain optimum adhesion with, and will be nonstaining to, installed pavers and other materials constituting paver installation.
 - 2. Submit a sufficient number of pavers and other materials involved in installation to allow comprehensive testing.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain mortar and grout manufacturer's written instructions for corrective measures, including the use of alternative materials to obtain optimum bond and prevent staining.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect unit pavers and aggregate during storage and construction against soiling or contamination from earth and other materials.
 - 1. Cover pavers with plastic or use other packaging materials that will prevent rust marks from steel strapping.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

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- C. Store liquids in tightly closed containers protected from freezing.
- D. Store asphalt cement and other bituminous materials in tightly closed containers.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout: Comply with the following requirements:
 - 1. Cold-Weather Requirements: Protect unit paver work against freezing when atmospheric temperature is 40 deg F (4 deg C) and falling. Heat materials to provide mortar and grout temperatures between 40 and 100 deg F (4 and 38 deg C). Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F (4 deg C), cover with weather-resistant membrane; below 25 deg F (minus 4 deg C), cover with insulating blankets; below 20 deg F (minus 7 deg C), provide enclosure and temporary heat to maintain temperature above 32 deg F (0 deg C).
 - 2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
 - a. When ambient temperature exceeds 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brick Pavers:
 - a. Boral Bricks, Inc.
 - b. Belden Brick Co.
 - c. Endicott Clay Products Co.
 - d. General Shale Products Corp.
 - e. Pine Hall Brick Co.
 - f. Old Carolina Brick Company
 - 2. Granite Pavers

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- a. Cold Springs Granite, 1-800-328-7038

2.2 COLORS AND TEXTURES

- A. Colors and Textures: All brick colors and textures shall match red clay brick pavers as indicated on drawings.

2.3 UNIT PAVERS

- A. Clay Brick Pavers: Light-traffic paving brick; ASTM C 902, Class SX, Type 1, Application PX., and ASTM C67. All brick to be solid.
 - 1. Size shall be standard 4"x 8" x 2-1/2" thick. Pavers shall not include spacer nibs on sides of brick and shall have square edges on the top surface. Brick paver shall have a minimum compressive strength of 10,000 psi and below 6% water absorption.
- B. Granite Pavers: Split edge pavers are a natural granite stone product. Thermal finished, ASTM C 97, 165 lbs/ft³ min., ASTM C 170 Compressive strength, 19,000 PSI Min. Provide custom face size as indicated on plan. Thickness: 1 15/16". Color shall be Mesabi or Charcoal Black.

2.4 ACCESSORIES

- A. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.5 AGGREGATE SETTING-BED MATERIALS

- A. Geotextile: Woven geotextile manufactured from polyester or polypropylene fibers, with a permeability rating 10 times greater than that of soil on which paving is founded and an apparent opening size small enough to prevent passage of fines from leveling course into graded aggregate of base course below. Overlap joints 36" minimum.
- B. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements of ASTM C 33 for fine aggregate. For all heavy duty paver installations fine aggregate shall be no more than 10% of material passing a No. 100 sieve and no more than 1% passing a No. 200 sieve.
- C. Polymeric Sand for Joints: Gator XP as manufactured by AllianceGator, 1-866-212-1611.
 - 1. Provide sand of color needed to produce required joint color.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations. Examine areas where waterproofing system is turned up or flashed against vertical surfaces and horizontal waterproofing. Proceed with installation only after protection is in place.

3.2 PREPARATION

- A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances, from concrete substrates, that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Proof-roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Joint Pattern: As indicated.
- E. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.
 - 1. Provide joint filler, where indicated, at waterproofing that is turned up on vertical surfaces; or, if not indicated, provide temporary filler or protection until paver installation is complete.
- F. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

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- G. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide joint filler as backing for sealant-filled joints where indicated. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 7 Section "Joint Sealants."
- H. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.
- I. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch (25 mm) below top edge.
 - 3. Install job-built concrete edge restraints to comply with requirements in Division 3 Section "Concrete Work".

3.4 AGGREGATE SETTING-BED PAVER APPLICATIONS

- A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density. Refer to section 'Earthwork' for more requirements.
- B. Place aggregate subbase and base in thickness indicated. Compact by tamping with plate vibrator and screed to depth required to allow setting of pavers.
- C. Place aggregate subbase and base over compacted subgrade. Provide compacted thickness indicated. Compact subbase and base to 100 percent of ASTM D 1557 maximum laboratory density and screed to depth required to allow setting of pavers.
- D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
- E. Treat leveling base with soil sterilizer to inhibit growth of grass and weeds.
- F. Set pavers with a minimum joint width of 1/16 inch (1.6 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
 - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- G. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
 - 1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.

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2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover open layers with nonstaining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.
- H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- I. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- J. Repeat joint-filling process 30 days later.

3.5 REPAIR, POINTING, CLEANING, AND PROTECTION

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with mortar or grout. Point up joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
 1. Remove protective coating as recommended by protective coating manufacturer and acceptable to unit paver and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

END OF SECTION 32 14 00

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SECTION 321723 - PAVEMENT MARKING

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 painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Standard Specifications for Roads and Bridges of North Carolina Department of Transportation for pavement-marking work.

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1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Dunn-Edwards Corporation.
 2. Ennis Traffic Safety Solutions, Inc.
 3. PPG Industries.
 4. Sherwin-Williams Company.

2.2 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 1. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

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- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

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SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel Chain Link Fence with 'Black' Polymer Coated Finish.
 - 2. Galvanized Steel Framework with 'Black' Polymer Coated Finish.
 - 3. Galvanized Steel Hardware with 'Black' Polymer Coated Finish.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Earthwork" for footing excavation filling and grading work.
 - 2. Division 3 Section "Cast in Place Concrete" for footings.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, foul poles.
- C. Shop drawings showing location of fence, gates, each post, foul poles, and details of post installation, extension arms, gate swing, hardware, and accessories.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.

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- B. Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source. Below is a list of approved manufactures for the color coated fence.

1. Merchant Metals-Color Bond II System
2. Master Halco
3. Ameristar
4. Approved equal

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 FABRIC

- A. Selvage: Knuckled on both selvages.
- B. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:
1. Mesh and Wire Size: 2-inch mesh, 0.192-inch diameter (Finished Gauge: 6).
 2. Polymer-Coated Fabric: Class 2a consisting of polymer coating extruded and adhered to zinc-coated steel wire. Core wire size to be 9 gauge with an 6 guage finish. Color; 'Black' Polymer Coated Finish.
 3. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.

2.2 FRAMING

- A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. Round members shall have same finish coating as fabric. The following indicates these equivalents all measured in inches:

Actual OD	NPS Size	Trade Size
1.315	1	1-3/8
1.660	1-1/4	1-5/8
1.900	1-1/2	2
2.375	2	2-1/2
2.875	2-1/2	3

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3.500	3	3-1/2
4.000	3-1/2	4
6.625	6	6-5/8
8.625	8	8-5/8

1. Type I (LCX) Framework for color coated fence shall be coated with 3 mil minimum polyester resin over galvanized steel ASTM F-1043, Group 1c with a minimum yield strength of 55,000 psi. Protective coating per ASTM F-1043, external coating type B Zinc with organic overcoat, 0.9 ounces per square foot Zinc coating with chromatic conversion coating and verifiable polymer film.

- B. Type I Round Posts: Standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, according to heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per sq. ft. Round members shall have same finish coating as fabric. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90, and weights per foot as follows:

Actual OD	Weight (lb/ft)	NPS Size
1.315	1.68	1
1.660	2.27	1-1/4
1.900	2.72	1-1/2
2.375	3.65	2
2.875	5.79	2-1/2
3.500	7.58	3
4.000	9.11	3-1/2
6.625	8.97	6
8.625	28.55	8

- C. Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swaged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull, and end post. All top rail shall have same finish coating as fabric.

1. Top Rail for Color Coated fence: 1.660-inch O.D. Type II DQ 40 pipe (0.111" wall thickness, 1.83 lb/ft).

- D. Steel posts for fabric heights up to 6 feet:

1. Round Line or Intermediate Posts for Color Coated fence: 2.375-inch OD Type II DQ 40 pipe (0.130" wall thickness, 3.12 lb/ft).
2. Round End, Corner, and Pull Posts for Color Coated fence: 2.875-inch OD Type II DQ 40 pipe (0.160" wall thickness, 4.64 lb/ft).

- E. Steel posts for fabric heights over 6 feet:

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1. Round Line or Intermediate Posts for Color Coated fence: 2.375-inch OD Type II DQ 40 pipe (0.130" wall thickness, 3.12 lb/ft).
 2. Round End, Corner, and Pull Posts for Color Coated fence: 2.875-inch OD Type II DQ 40 pipe (0.160" wall thickness, 4.64 lb/ft).
 3. Round Gate Posts for Color Coated fence: 4.00-inch OD Type II DQ 40 pipe (0.160" wall thickness, 4.973 lb/ft).
- F. Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows for steel pipe posts. Gate members shall have same finish coating as fabric
1. Steel posts for fabric height of 6 feet or less and gate leaf width:
 - a. Up to and Including 4 Feet: 2.875-inch OD pipe weighing at least 4.64 lb per ft. Fabric for Color Coated fence as specified above.
 - b. Over 4 to 10 Feet: 4.000-inch OD pipe weighing at least 8.65 lb per ft. Fabric for Color Coated fence as specified above.
- G. Polymer Coating finish over framework:
1. Color: 'Black' Polymer-Coating to match fabric finish, complying with ASTM F934.

2.3 FITTINGS AND ACCESSORIES

- A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.
1. Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
 2. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
- B. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.
1. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
- C. Post Brace Assembly: Manufacturer's standard adjustable brace. Use material specified below for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.
1. Round Steel: 1.660-inch OD Type I steel pipe.

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2. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
- D. Bottom and Center Rail: Same material as top rail unless indicated otherwise. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.
 1. Color Coated Fence: Same material as Color Coated top rail.
- E. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.
 1. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
- F. Tension and Brace Bands: 3/4-inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.
 1. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
 2. Tension Bands: 0.074 inch thick (14 gage) minimum.
 3. Brace Bands: 0.105 inch thick (12 gage) minimum.
- G. Tension Wire: 0.177-inch-diameter metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.
 1. Coating Type II zinc in the following class as determined by ASTM A 90.
 - a. Class 2, with a minimum coating weight of 1.20 oz. per sq. ft. of uncoated wire surface.
 2. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
- H. Tie Wires: 0.106-inch-diameter (12-gage) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating according to ASTM A 641, Class 3 or 0.148-inch-diameter (9-gage) aluminum wire alloy 1350-H19 or equal, to match fabric wire.
 1. Color Coated Fence: Provide polymer coating, 6 mils minimum, over hot dipped galvanized pressed steel.
- I. Polymer Coating finish over fittings and accessories:
 1. Color: 'Black' Polymer-Coating to match fabric finish, complying with ASTM F934.

2.4 CONCRETE

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- A. Concrete: Provide concrete consisting of portland cement per ASTM C 150, aggregates per ASTM C 33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi. Use at least four sacks of cement per cu. yd., 1-inch maximum size aggregate, 3-inch maximum slump.
- B. Packaged Concrete Mix: Mix dry-packaged normal-weight concrete conforming to ASTM C 387 with clean water to obtain a 2- to 3-inch slump.

2.5 GATES

- A. Fabricate perimeter frames of gates from same material and finish as fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8 feet apart unless otherwise indicated.
 - 1. Fabric: Same as for fence unless otherwise indicated. Secure fabric at vertical edges with tension bars and bands and to top and bottom of frame with tie wires.
 - 2. Bracing: Install diagonal cross-bracing consisting of 5/16-inch-diameter adjustable-length truss rods on gates to ensure frame rigidity without sag or twist.
 - 3. Color Coated Fence: Fabric, bracing, framing, fittings, and accessories same as for Color Coated fence specified herein.
- C. Swing Gates: Comply with ASTM F 900.
 - 1. Steel: Gates up to 8 feet wide:
 - a. Up to 6 Feet High: Fabricate perimeter frames of 1.660-inch minimum OD Type I steel pipe or 1-1/2-inch-square galvanized-steel tubing weighing 1.84 lb per sq. ft.
 - b. Over 6 Feet High: Fabricate perimeter frames of 1.90-inch minimum OD Type I steel pipe or 2-inch-square galvanized-steel tubing weighing 2.52 lb per sq. ft.
 - c. Color Coated Fence: Shall match materials and finish of fence.
 - 2. Gate Hardware: Provide galvanized hardware and accessories for each gate according to the following:
 - a. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.
 - b. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as an integral part of latch.
 - c. Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.

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- d. Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. Include a locking device and padlock eyes as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.
 - e. Color Coated Fence: All hardware shall match materials and finish of other fence.
- D. Polymer Coating finish over gate system and accessories:
- 1. Color: 'Black' Polymer-Coating to match fabric finish, complying with ASTM F934.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
 - 1. Apply fabric to outside of framework.
- B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
 - 1. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
 - 2. Coordinate excavation with turf contractor.
- C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.
 - 1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - a. Unless otherwise indicated, maintain concrete footings 2 inches below finished grade.
 - 3. Coordinate excavation with turf contractor.
 - a. Provide and install any sleeving required to sequence work with concrete curb installation.
 - b. Sleeved footing installation will occur separately from fence post installation and requires additional re-mobilization.

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- D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
- E. Center Rails: Install center rails in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary.
- F. Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gauge and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.
- H. Fabric: Leave approximately 1/2 inch between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.
- J. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.
 - 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.

3.2 GATE INSTALLATION

- A. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. Install gates according to manufacturer's instructions, plumb, level, and secure.

3.3 ADJUSTING

- A. Gates: After repeated operation of completed installation equivalent to 3 days' use by normal traffic, re-adjust gates and controls for optimum operating condition and safety. Lubricate and clean exposed surfaces.

3.4 WARRANTY

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- A. Color Coated Fence: Shall have a 15 year minimum warranty against failure due to rust or corrosion.

END OF SECTION - 32 31 13

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SECTION 323300 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work required under this section consists of furnishing all labor, materials, equipment, services, and related items necessary to supply and install Site Furnishings, and all related work, to be complete, as indicated on the drawings and specified herein. This Section includes the following:
 - 1. Bicycle Rack
 - 2. Trash Receptacles
 - 3. Benches
 - 4. Bleachers
 - 5. Dugout Team Benches
 - 6. Drinking Fountains

1.2 RELATED WORK

- A. Examine Contract Documents for requirements that affect the work of this section. Other specification sections that directly relate to the work of this Section include, but are not limited to:
 - 1. Division 31 – Earthwork

1.3 QUALITY ASSURANCE:

- A. Installer shall be a firm having a minimum of five (5) years successful experience in the installation of Site Furnishings similar to the size, scope and complexity of this project as shown and specified and who can demonstrate said experience through documented references.
- B. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.4 SUBMITTALS

- A. Product Data: Descriptive data of installation, methods, procedures and maintenance.
 - 1. Submit catalog cuts, specifications, and installation instructions for each site furnishing item.

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1.5 COORDINATION:

- A. Before any work is started, a conference shall be held between the Contractor and the Project Consultant concerning the work under this Contract.

1.6 SUBSTITUTION AND REJECTION:

- A. The Project Consultant reserves the right to reject material or work which does not conform to the Contract Documents. Rejected work shall be removed or corrected at the earliest possible time.

1.7 PROTECTION:

- A. The Contractor shall be responsible for work until finally inspected and accepted. After delivery and before and after installation, protect work against theft, injury, or damage.
- B. The Contractor shall protect work, equipment and material of all other trades from damage that might be caused by this work or workmen and shall pay for all such damage, should it occur.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. All Site Furnishings shall be new and in perfect condition. After award of the Contract, and prior to beginning the work, the Contractor shall submit for approval, two copies of the complete list of materials which he proposes to install. Deviations from the specifications without approval from Project Consultant shall not be allowed.

2.2 MATERIALS

- A. **BICYCLE RACK – Contractor provided and installed.**
 - 1. Description: See drawings for location. Provide permanent in ground mount. Provide power coated finish. Color to match existing installations. Bike rack is 6'-6" long by 5'-2" high. Match the existing bike rack style at the YMCA building and existing baseball / softball facility.
 - 2. Acceptable Manufacturer Product Selection:
 - a. Columbia Cascade
Model: Artful Cycloops 2178-41-E-C
800-547-1940
 - b. Approved equal.

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B. TRASH RECEPTACLES- **Contractor provided and installed.**

1. Description: Provide square powder coated steel trash can with dome top lid, metal or plastic liner, and complete hardware. Lid, Liner and hardware to match can color. Provide in ground concrete foundation per manufacturer's recommendation. Color to be black. Field verify location with Project Consultant. Trash receptacles shall match benches. Both benches and trash receptacles match the existing ones at the Community Center court yard and existing baseball / softball facility.
2. Acceptable Manufacturer Product Selection:
 - a. Wabash Valley:
Model: Yorktown 32 Gallon Trash Receptacle SKU: YO3F33CK01
800-253-8619
 - b. Approved equal.

C. BENCHES – **Contractor provided and installed.**

1. Description: Provide 6' long arch back bench with powder coated steel frame. Color of complete bench assembly (seat, back, and undercarriage) to be black. Provide portable mount, per manufacturer's recommendation at locations shown on plan. Field verify location with Project Consultant. Benches shall match trash can.
2. Acceptable Manufacturer Product Selection:
 - a. Wabash Valley:
Model: Yorktown Outdoor Bench SKU: YO1213CK01
800-253-8619
 - b. Approved equal.

D. PICNIC TABLES – **Contractor provided and installed.**

1. Description: Provide four (4) tables at each picnic shelter. One (1) of the four (4) tables shall be the ADA compliant model. Provide portable, plastisol coated finish, rectangular, 6 feet in length, 2 3/8" powder coated finish on frames. Provide all hardware and assembly. Color to match existing tables at existing baseball / softball fields. ADA tables will be 8 feet in length. Provide expanded surface and traditional edge.
2. Acceptable Manufacturer Product Selection, 6' length:
 - a. Anova
Model: Item #F2003
800-325-3047
 - b. Webcoat Products
800-505-5101

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- c. Barco Products
800-338-2697
- 3. Acceptable Manufacturer Product Selection, 8' length ADA compliant
 - a. Anova
Model: Item #F1038
800-325-3047
 - b. Webcoat Products
800-505-5101
 - c. Barco Products
 - d. 800-338-2697
- E. BLEACHERS – Contractor provided and installed.
 - 1. Description: Contractor shall provide and install all aluminum frame and plank, contiguous, low rise, standard, non-elevated bleacher systems where indicated on plans. Bleacher system shall be 5 rows, 21'-0" length, with chainlink fence. Bleacher system shall provide 2 ADA wheelchair seating spaces. Contractor shall ensure clear ADA compliant route to wheelchair seating as demonstrated per plans, and that all applicable ADA requirements are met.
 - 2. Acceptable Manufacturer Product Selection:
 - a. Belson Outdoors
Non-Elevated Aluminum 5 Row x 21'-0" Bleacher
Model: BD-U0521CC
800-323-5664
 - b. National Recreation System
Non-Elevated Aluminum 5 Row x 21'-0" Bleacher
Model: NA-0521ADA_CLC
888-568-9064
 - c. Approved equal.
- F. DUGOUT TEAM BENCHES – Contractor provided and installed.
 - 1. Description: Contractor is responsible to coordinate receipt of equipment from supplier, transport to site, assemble, and install in place. This includes anchoring/bolting to concrete pad. Team benches shall be aluminum with backs. See construction documents for length and location. Provide portable mount assembly per manufacturer's recommendations at locations shown on plans. Maintain the manufacturer's suggested seat height.
 - 2. Acceptable Manufacturer Product Selection:
 - a. Kay Park Recreation (866-741-8266)
27' Dugout Shelf-Back Players Bench
Model: SKU: 27DSBPBA

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G. DRINKING FOUNTAIN – Contractor provided and installed.

1. Description: Provide barrier free, accessible, pedestal drinking fountain with modular low fountain and bottle filler attachments. Provide powder coat finish. Standard color as selected by Project Consultant. Provide direct burial installation in concrete. Size of concrete shall be per manufacturer's recommendation. See plans for location. At each field, mirror attachments at opposite dugouts as indicated in plans: standing fountain shall be located on center pedestal, wheelchair accessible fountain shall be located on side closest to field, and bottle filler shall be located on side furthest from field. Maintain wheelchair turning radius between fountain assemblies and dugout benches as mandated per ADA requirements. Field verify installation/orientation of fountain with Architect prior to installation.
2. Acceptable Manufacturer Product Selection:
 - a. Haws Corporation Model #3612BFA
ADA Outdoor Stainless Steel Bottle Filler and Dual Fountain
Model: #3612BFA
866-741-8266

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Locate all site furnishings where indicated on the drawings and attach as detailed on the drawings and as elaborated upon in the specifications and in conformance with manufacturer's recommendation.
- B. Any item locations not specifically detailed in the Contract Documents shall be located at the direction of the Project Consultant.
- C. The trade performing the work of this section assumes full and sole responsibility for the accuracy and correctness of all layouts, lines, levels, grades, and other aspects of the work under this section. Layout all work in accordance with the requirements, therefore, as indicated in the drawings.
- D. Clean and touch-up paint all abraded, welded, and scratched surfaces with matching paint provided by each site furnishing manufacturer.

3.2 CLEANING:

- A. Perform cleaning during installation of the work and upon completion of the work.

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- B. Remove from the project site any excess material and equipment at the completion of the work of this section.
- C. Repair any damage resulting from Site Furnishings' installation work.

END OF SECTION 323300

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SECTION 32 80 00 - IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provision of Contract, including General and Special Conditions, apply to work of this section.

1.2 DESCRIPTION / SCOPE OF WORK

1. Provide underground irrigation system upgrades and expansion for the site as shown and specified. The work includes:
 1. Automatic irrigation system including piping, fittings, sprinkler heads, and accessories.
 2. Valves and fittings
 3. Control wire
 4. Testing
 5. Project includes installation of well to deliver water requirements for the irrigation system as outlined on associated drawings.
 6. Installation of Pentair VFD drive & pressure tank for well electrical controls.

1.3 QUALITY ASSURANCE

1. Excavating and back filling irrigation system work.
1. Contractor qualifications:
 1. The following documentation or verification of the qualifications must be provided with your bid in order to be considered responsive:
 1. Virginia Class A contractor's license showing a specialty in irrigation.
 2. General liability insurance to \$1,000,000.
 3. Three verifiable references to attest to the contractor's ability to install irrigation systems of similar size and scope of work.
 4. Irrigation Contractor must possess a current irrigation license through the North Carolina Irrigation Contractors' Licensing Board. Proof of license will be required with product submittals for the project.
 2. Three (3) projects involving the installation and programming of

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WeatherTrak control systems within the last three (3) years.

3. Experience of individual working for the contracting company will not be accepted as qualified job submittals. Experience must come from the company. Omission of any required information will be grounds for disqualification.
 4. Only one irrigation bid will be accepted for the project. No qualified bids will be accepted.
 5. Contractors must have in-house capability and experience with system programming, troubleshooting, and maintenance repairs and the required hardware and software to perform those services.
 6. Contractor must be able to “optimize” the WeatherTrak control system to include asset mapping of zones and other relevant installed equipment, flow rate per zone, soil type & sun exposure per zone, equipment type, and programming for grow in/maintenance of desired turf.
2. Conform to applicable codes for piping and component requirements.
 3. Materials, equipment, and methods of installation shall comply with the following codes and standards:
 1. Currituck County Public Utilities and Public Works Standards.
 2. National Fire Protection Association, (NFPA): National Electrical Code.
 3. American Society of Testing and Materials, (ASTM).
 4. National Sanitation Foundation, (NSF).
 4. Obtain project manager/general contractors’ acceptance of installed and tested irrigation system prior to installing backfill materials. All mainline and lateral PVC lines must meet these criteria.

1.4 SUBMITTALS

1. Submit manufacturer’s product data and installation instructions for each of the system components to include electric valves, heads, controller, wire, pipe, fittings, valve boxes, manual valves, wire splices, and all other equipment installed on project. Submittals must be organized and semi-permanently bound in booklet form with a table of contents for each section. This document must be periodically updated as material changes on the project.
2. Upon irrigation system acceptance, submit written operating and maintenance instructions. Provide format and contents as directed by the owner’s designated representative.

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3. Upon project completion provide an updated as-built of the installed system in digital and paper copy form. All installed field assets shall be accurately assigned within the WeatherTrak operating system.

1.5 DELIVERY, STORAGE, AND HANDLING

1. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible. The general contractor shall provide a staging area.
2. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, either threaded or plain.
3. Store and handle materials to prevent damage and deterioration.
4. Provide secure, locked storage for valves, sprinkler heads, and similar components that cannot be immediately replaced, to prevent installation delays.

1.6 PROJECT CONDITIONS

1. Known underground and surface utility lines are indicated on the associated utility drawings. Private utilities are known to be within the areas of work. Coordinate with the owner for marking of private utilities to avoid damages prior to beginning any excavation.
2. Protect existing trees, plants, lawns, and other features designated to remain as natural areas. Field adjust main and lateral PVC lines as needed during construction to avoid conflicts with existing utilities and update changes on the as-built document.
3. Promptly repair damage to adjacent facilities caused by irrigation system work operations. Cost of repairs at contractor's expense.
4. Promptly notify the project designated representative of unexpected sub-surface conditions.
5. Irrigation system layout is diagrammatic. Irrigation contractor shall establish exact locations of piping, sprinkler heads, valves, and other components at time of installation. Contractor is ultimately responsible for maintaining 100% head-to-head coverage on entire irrigated area indicated on the irrigation plan.
 1. Space sprinkler components as indicated.
 2. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. Final system layout shall be acceptable to the Currituck County designated representative.

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6. Cutting and patching:
 1. Cut through concrete and masonry with core drills. Jackhammers are not permitted.
 2. Materials and finishes for patching shall match existing cut surface materials and finish. Exercise special care to provide patching at openings and exterior walls. Subject to approval of the General Contractor and property owner.
 3. Methods and materials used for cutting and patching shall be acceptable to the General Contractor.
 4. Sleeving locations are indicated on the accompanying irrigation plan. It is the responsibility of the contractor to bore necessary crossings at the depths identified within this specification to prevent damage to sidewalks. Contractor is responsible for correcting damages to sidewalks during construction of the irrigation system.

PART 2 - PRODUCTS

2.1 MATERIALS

1. General:
 1. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind to be provided by an authorized Product Distributor. Product distributors may be asked to submit their factory authorization to sell and service all components that they provide.
 2. Comply with pipe sizes indicated. No substitution of smaller pipe sizes will be permitted. Larger sizes may be used subject to acceptance of the Currituck County designated representative. Remove damaged and defective pipe.
 3. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size schedule and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (NSF) approval.
2. Plastic pipe, fittings, and connections:
 1. 3.0" diameter and under: PR 200, bell end PVC.
 2. PVC pipe fittings: ASTM D2241 schedule 40 PVC molded fittings suitable for solvent weld connections. Fittings made of other materials are not permitted. Saddle and cross fittings not permitted.

Master Valve

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1. Normally closed Rainbird 2" electric valve, part number 200 PESB. Master valve shall be installed in a jumbo valve box as shown on irrigation plan with a line sized sch 80 tru-union ball valves for future service. Separate 14/2 jacketed two wire shall be installed from the controller to the master valve.

Flow Sensor

1. QS200-20 to be installed after the master valve in a jumbo valve box as shown on the irrigation plan. A shielded cable shall be installed from the controller to the flow sensor or shall be connected to the two wire path and installed with a flow sensor decoder, part number WT2W-H20-FS.

Wire

1. Field wiring to be 14/2 PE Decoder jacketed two wire gauge, **Part # REG1402GDC35**. Install blue 14-gauge tracer wire along PVC mainline for locating purposes. Red & Blue 14/2 jacketed wire shall be installed from the controller to the field for the new irrigation system.
2. Low voltage wire connectors: Socket seal type wire connectors and waterproof gel sealer with wire connectors 3M DBR's, 600V rated, or approved equal only. **Part # 270672**
3. Ground plates, 4" x 3' **Part # PAI182201IC with GEM Part # PAI1820058** shall be installed as shown on the irrigation plan in conjunction with WeatherTrak two wire surge arrestors, **Part # HYDWT2W-H20-SA**. All splices shall be installed in a 10" valve box for serviceability.

Field Controller

1. WeatherTrak Pro 3 two wire controller is to be installed in mechanical room as shown on the irrigation plan. Control system shall include 4 years of additional communication service as part of this scope of work.
2. Irritrol RS 1000 rain sensor to be installed with controller.
3. Pre-programmed single station WeatherTrak decoders, HYDWT2W-H20-1VDP, shall be installed using 6000V splice connectors per manufacturer's instructions.

VFD Drive

1. Pentair VFD drive shall be installed as part of the well control to deliver consistent pressure to the irrigation system. Well driller to verify power supply and size drive and pump accordingly.

Sprinkler Heads

1. Spray Heads to be 1806 Rainbird Sam as shown on irrigation plan.

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2. Spray Nozzles – Hunter MP rotator and Rainbird MPR nozzles as shown on drawing. Adjust radius and spray patterns to achieve necessary coverage.
3. All turf gear rotors to be **Part # Rainbird 5004+PC SAM** model to include check valve. Sport field rotors shall be Falcon 6504 Full and PC as shown on plan mounted on Rainbird 1” swing joints, model number RAI66705.

Backflow Prevention

1. Not included in scope of work.

Valves

1. Valves to be installed are Rainbird 150 PESB and 100 PESB valves installed Rainbird professional series standard valve boxes. All valves operating spray heads with MPR nozzles shall include PRS-D dial on valve and set to optimal operating pressure for the designated nozzle.
2. As shown on Drawing. Quick Coupling Valve shall be ¾” Rainbird to include keys and brass hose collars.
Quick Couplers to be Field located with owner’s approval.

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3.All Electric & Isolation Valves to be installed in Rainbird commercial series valve boxes. No more than two (2) 1" valves to be installed in a Standard valve box.

2.2 ACCESSORIES

1. Drainage fill: ¾" washed pea gravel.
2. Fill: Clean soil free of stones larger than 1" diameter foreign matter, organic Material and debris.
 1. Provide imported fill material as required to complete the work. Obtain rights and pay all costs for imported materials.
 2. Suitable excavated materials removed to accommodate the irrigation system work may be used as fill material subject to the project manager's review and acceptance.

PART 3 - EXECUTION

3.1 INSPECTION

1. Examine final grades and installation conditions. Verify that field measurements are as shown on drawings. Do not start irrigation system work until unsatisfactory conditions are corrected.
2. Verify the location of utilities, plant materials, shrub bed lines, and tree lines. Contractor is responsible for coordinating the location of all trees with landscape contractor.
3. Verify that required utilities are available, in proper location, and ready for use.
4. Beginning of installation means installer accepts existing conditions.
5. Contractor must provide one experienced on-site foreman or supervisor who must be on-site at all times when a crew is working. The General Contractor will be supplied with this designated individuals contact information (to include email and cell phone number) prior to commencing work.

3.2 PREPARATION

1. Prior to excavation, utility companies shall be notified in accordance with local codes and ordinances. Contractor must contact Miss Utility prior to beginning of installation and maintain current authorizations during duration of construction. All

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current Miss Utility rules for contact and excavation will be followed.

2. Contractor shall be responsible for damage to existing utilities and structures due to negligence and/or misuse by their crews or equipment.
3. Stripping sod for pipe trenches will not be necessary. Tamping and returning to existing grade will be acceptable.
4. Place sleeves as necessary for installation of piping and control wire. All piping under walks and walls shall be within a Schedule 40 PVC sleeve 2 sizes larger than the pressure pipe.
5. Well and Electrical to be provided by owners.

3.3 INSTALLATION

1. Excavating and back filling:
 1. All excavation shall be considered unclassified excavation and include all material encountered.
 2. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings.
 3. Excavate to depths required to provide 3" depth of debris free earth fill or sand bedding for piping when rock or other unsuitable bearing material is encountered.
 4. Fill to match adjacent grade elevations with approved earth fill material. Place and compact fill in layers not greater than 8" depth.
 1. Provide approved earth fill or sand to a point 4" above the top of pipe.
 2. Fill to within 6" of final grade with approved excavated or borrow fill materials free of lumps or rocks larger than 1" in any dimension.
 3. Provide clean topsoil fill free of rocks and debris for top 6" of fill.
5. Install irrigation lateral lines with a minimum cover of 18" based on finished grades. Install irrigation mainline with a minimum of 24" based on finished grade.
6. When two (2) pipes are to be placed in the same trench, a six (6) inch space is to be maintained between the pipes. The Contractor shall not install 2 pipes with one directly above the other.

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7. Trenches located under paving shall be backfilled with sand (a layer six (6) inches below the pipe and three (3) inches above the pipe) and compacted in layers of 95% compaction. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
 - (1) – 12 inches over non-pressure lateral lines
 - (2) – 24 inches over non-pressure lateral lines under paving
 - (3) – 18 inches over control wires
 - (4) – 18 inches over sprinkler main line
 - (5) – 24 inches over sprinkler main line under paving
 8. Excavate trenches and install piping and fill during the same working day. Do not leave open trenches or partially filled trenches open overnight.
2. Plastic pipe:
1. Install PVC pipe in accordance with manufacturer's installation instructions. Provide for thermal expansion and contraction. Do not install plastic pipe if temperature is below 32 degrees.
 2. Saw cut plastic pipe. Use an electric miter saw, to ensure a square cut. Remove burs and shavings at cut ends prior to installation. Use a hand beveller on all gasket pipe cuts.
 3. Use only solvent recommended by the pipe manufacturer. Install plastic pipe fittings in accordance with pipe manufacturer's instructions. Contractor shall make arrangements with pipe manufacturer for all necessary field assistance.
 4. Make plastic to metal joints with sch 80 PVC male adapters.
 5. Make solvent weld joints in accordance with manufacturer's recommendations.
 6. All lateral connections to the main line as well as other connections shall be made to the side of the main line pipe. No connections to the top of the line shall be allowed.
 7. Allow joints to set **at least 24 hours** before pressure is applied to the system.
 8. Maintain pipe interiors free of dirt and debris. Close open ends of pipe by acceptable methods (duct tape ends) when pipe installation is not in progress.
3. Sprinklers, fittings, valves, and accessories:
1. Install fittings, valves, sprinkler heads, risers, and accessories in accordance

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with manufacturer's instructions, except as otherwise indicated.

2. Set sprinkler heads perpendicular to finished grades, except as otherwise indicated.
 3. Locate sprinkler heads to assure 100% Head to Head coverage of indicated areas. Do not exceed sprinkler head spacing distances indicated. Contractor is responsible for site adjustments to achieve desired coverage.
 4. Install quick-coupling valves with an adjustable double swing joint riser assembled by the use of at least 3 standard 90-degree elbows. Fabricate double swing joint risers of schedule 80 PVC nipples and schedule 40 PVC elbows. Pre-fabricated swing joints are acceptable. Top of the Quick Coupler Valve to be no more than 2" below finished grade.
 5. Install controller in accordance with manufacturer's written instructions. All controller footings will be 12" deep concrete.
 6. Install valve access boxes on a suitable base of bricks to provide a level foundation at proper grade and to provide drainage of the access box. 11/2 cubic feet of pea gravel below box to be provided for drainage.
 7. Automatic valves shall be installed plumb with valve access box with all valve handles, bolts, connections and electrical splices accessible through the valves box opening (not less than 6" below valve box cover).
 8. All seal threaded connections of control valves with Teflon tape. Plastic joint type compound is not acceptable.
4. Control wiring:
1. Contractor to coil green tracer wire at each valve and isolation valve. Where necessary to run wire in a separate trench, provide a minimum cover of 18". Wire cannot be plowed or pulled with a vibratory plow. All splices to be made in valve boxes.
 2. Provide sufficient slack at site connections at remote control valves in control boxes and at all wire splices to allow raising the valve bonnet or splice to the surface without disconnecting the wires when repair is required.
 3. Connect each remote control valve to one individual decoder.
 4. Make wire connections to remote control electric valves and splices of wire in the field, using waterproof DBR 600V wire connectors and sealing cement in accordance with manufacturer's recommendations. Dry splices will not be accepted. Make wire splices in accessible valve boxes 10" in

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diameter or greater. All splices to be contained inside valve boxes ONLY.

5. Provide tight joints to prevent leakage of water and corrosion build-up on the joint.
 6. When control wiring is in common trench with main line, wiring shall be below main line with 4" of fill dirt between pipe and wire.
 7. Above ground wire is to be installed in conduit and/or in accordance with electrical codes.
 8. All materials and methods of installation shall conform to local electrical codes.
5. Quick-Coupling valves:
1. Provide a 12" valve box for location. Stabilize the valve with a stake and 1 1/2" cubic feet of pea gravel (□□□ to 3/4").
6. Field satellite:
1. Field satellite shall be installed as per manufacturer's recommendation. All grounding equipment shall be included.
7. Flushing, testing, and adjustment:
1. Perform system testing upon completion of each section. Make necessary repairs and retest-repaired sections as required.
 2. Adjust sprinklers after installation for proper and adequate distribution of the water over the coverage pattern. Adjust for the proper arc of coverage.
 3. Adjust all electric remote control valve flow control stems for system balance. Contractor must set pressure-regulating valves prior to acceptance specification on design.
 4. Test and demonstrate the controller by operating all programs, day, hour, and station selection features as required to automatically start and shut down irrigation cycles to accommodate plant requirements and weather conditions.
 5. After sprinkler piping and risers are installed and before sprinkler heads are installed, open control valves and flush out the system with full head of water.
8. Service:
1. Contractor shall return to the site during the subsequent fall season and

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winterize the system. Drain all water from the system and blow out the system with compressed air.

2. Contractor shall return to the site during the subsequent spring season and demonstrate to the Owner Representative the proper procedures for the system start-up, operation, and maintenance.
3. After 3 months of continuous operation, after acceptance of job, contractor must return to the site and re-adjust all irrigation heads, by re-packing heads that have become dislodged due to resettling of ground, torque of spray, or vibration. Re-adjust radius, arc, and trajectory of spray of all heads.

3.4 DISPOSAL OF WASTE MATERIAL

1. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris.
2. Maintain work site clear, clean, and free of debris.

3.5 ACCEPTANCE

1. Test and demonstrate to the General Contractor and property owner the satisfactory operation of the system free of leaks.
2. Instruct the Owners designated personnel in the operation of the system including adjustment of sprinklers, controller(s), valves, and pump controls.
3. Upon acceptance, the Owner will assume operation of the system.
4. Provide owner with all manuals for products used on project.
5. Provide irrigation system record drawings:
 1. Legibly mark drawings to record actual construction.
 2. Identify field changes of dimension and detail and changes made by Change Order, if any.
 3. As-Builts shall also indicate control valve wiring routing paths, wire splice locations, valve locations with zone number, isolation valves, and controller location.
 4. Provide owners with a digital copy with a pdf, and cad drawing of the as-built.

3.6 GUARANTEE

1. The contractor shall guarantee all workmanship covered by the specifications to be free of defects for a period of one (1) year from the date of final acceptance of the project. Contractor shall replace any part or parts found to be defective within the

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period of guarantee at no cost to the owner, except repairs or replacement necessitated by damage of others.

2. Back filling of all excavation shall be guaranteed. If, at any time during the first year of the guarantee period, trenches or heads should settle, the irrigation contractor shall repair any settling at no cost to the owner.

3.7 CLEANING

1. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from irrigation system installation.

END OF SECTION 32 80 00

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SECTION 32 84 10 — WELL PUMP SYSTEM

PART 1 - GENERAL

1.1 GENERAL

- A. The contractor shall provide shop drawings (hereto referenced as “Drawings”) adequate for permits for the proposed production well. The production well required to meet these Specifications must be interpreted and are intended to complement each other. The Contractor shall furnish and install all parts, which may be required by the approved Drawings and omitted by the Specifications, or vice versa, just as though required by both. Should there appear to be discrepancies or question of intent, the Contractor shall refer the matter to the Consultant for decision, and his interpretation shall be final, conclusive and binding.
- B. The Work shall be constructed and finished in every respect in a good, Workmanlike and substantial manner, to the full intent and meaning of the Drawings and Specifications. All parts necessary for the proper and complete execution of the Work, whether the same may have been specifically mentioned or not, or indicated on the Drawings, shall be done or furnished in a manner corresponding with the rest of the Work as if the same were specifically herein described.

1.2 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.

1.3 EXISTING CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions on the site before submitting his bid, and shall be fully responsible for carrying out all Work, required to fully and properly execute the Work of the Contract, regardless of the conditions encountered in the actual Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

1.4 SCOPE

- A. Contractor shall provide all labor, materials, equipment and services to complete the Work of this Section as indicated on the Drawings, specified herein, or both.
- B. The electrical point of connection for the irrigation pump system shall be to a new 208-volt, three phase electrical service provided by the electrical contractor to the electrical disconnect on the exterior of the pump system control panel. Coordinate final electrical service locations with the Electrical Engineer.
- C. Contractor shall construct up to two (2) test wells to determine soils quality, estimate screen set and provide water sample. Contractor will perform a 24 hour pumping test of the test well(s) monitoring and recording the static water level and pump flow rate at regular intervals to determine the sustained pumping rate of the well and also the well recharge rate after pumping has terminated. Test wells to be a minimum of 60 feet deep. Test wells to be filled or capped after testing.
- D. Once test well(s) have been constructed and tested, Contractor to determine proper construction, screen setting depth, screen size, casing size, flow rate (gpm) and pump equipment size and submit to the Owner's Representative for approval prior to construction of the production well(s). Well construction shall minimize granular particle intrusion during pumping.
- E. Contractor shall provide and install ground water well pump system(s) capable of providing 60-gpm at a pressure of 75-psi at the connection to the irrigation system. Pump system(s) to include all piping and controls necessary for proper operation and connection of multiple wells,

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if required, to the irrigation system.

- F. Contractor to carry the cost for the construction of up to two (2) production wells in their bid including enclosures.
- G. The following assumptions are provided as a basis for bid only. Final equipment sizes and depths will be determined after test well construction and testing.
 - 1. Two (2) total test wells
 - 2. Two (2) total production wells
 - 3. Production well depth of 60 feet min
 - 4. Production well screens to be 6-inch inner screen with 12-inch outer screen and annular space filled with crushed stone
 - 5. 7.5 horsepower pump motors

1.5 ORDINANCES, PERMITS AND FEES

- A. The Work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.
- B. The Contractor shall prepare for and obtain and pay for any and all permits, tests and certifications required for the execution of Work under this Section.
- C. Furnish copies of Permits, Certifications and Approval Notices to the Owner's Representative prior to requesting payment.

1.6 QUALITY ASSURANCE

- A. Installer: A firm, which has at least five (5) years of experience in Work of the type and size as required by this Section and which is acceptable to the Owner's Representative.
- B. References: Upon Request, the Contractor must supply three references for Work of this type and size including names and phone numbers of contact person(s).
- C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
 - 1. American Society for Testing & Materials (ASTM)
 - 2. National Plumbing Code (NPC)
 - 3. National Electric Code (NEC)
 - 4. National Sanitary Foundation (NSF)
 - 5. American Society of Agricultural Engineers (ASAE)
 - 6. Underwriters Laboratories, Inc. (UL)
 - 7. Occupational Safety and Health Regulations (OSHA)

1.7 TESTS

- A. Observation: The Owner's Representative will be on site at various times to ensure the system is being installed according to the Specifications and Drawings.
- B. Operational Test: After completion of the system, test the operation of entire system and adjust as directed by the Owner's Representative. Demonstrate to the Owner's Representative that all is operating as designed and specified (See Part 3 Execution).

1.8 PRECONSTRUCTION SUBMITTALS

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- A. Product Data: For each type of product required, include rated capacities, operating characteristics and furnished specialties and accessories. Where multiple models are listed on a manufacturer's product data, clearly indicate the model being submitted.
- B. Qualification Data:
 - 1. Contractor shall have a minimum of five (5) years of experience installing systems of similar size and complexity.

1.9 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Manual: The Irrigation Contractor shall provide three (3) binders labeled OPERATION AND MAINTENANCE INSTRUCTIONS FOR THE MAPLE PARK EXPANSION PHASE 2 WELL PUMP SYSTEM. The following information shall be included in the manual:
 - 1. Owner's manuals indicating adjustment and maintenance for all components in the irrigation system
 - 2. Copies of the Approved product submittals
 - 3. One copy of the pump system Record Drawing
 - 4. Winterization and Spring start-up procedures
 - 5. Warranty information
 - 6. Contractor's contact information

1.10 WARRANTY

- A. Contractor shall warranty all material and work for a period of one year after final acceptance. Warranty shall include one winterization and one spring start-up.

PART 2 - MATERIALS

2.1 GENERAL

- A. The pump system shall be capable of providing a total of 60-gpm at a pressure of 75-psi at the pump system point of connection to the irrigation system. The pump shall operate at no more than 3600 RPM. The power supply to the station shall be 208-volt, three phase electrical service.
- B. Operational sequence: The pump shall activate automatically upon detecting a drop in pressure in the irrigation main line. Operation shall be maintained at an adjustable minimum demand. The pump shall be automatically retired when the demand falls below the minimum adjustable set point for an adjustable time delay.
- C. Each well pump system shall operate independently of the other well pump systems.

2.2 PUMP AND MOTOR

- A. PUMP: Pump shall be submersible type and have a cast 304 stainless steel discharge head and motor adapter. Bearings shall be replaceable silicon carbide. Pump shall have a built-in check valve and stainless steel impellers, suction screen, fasteners and cable guard. Pump shall have a removable stainless steel, splined coupling.
- B. MOTOR: Pump motor shall be designed to NEMA standards, have stainless steel casing, water filled design to provide a constant supply of lubrication, hermetically sealed stator, durable Kingsbury type thrust bearing and replaceable motor lead assembly.

2.3 PIPING

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- A. All piping shall be galvanized steel and conform to ASTM specifications A53 for Grade B welded or seamless schedule 40 pipe. All fittings shall be seamless, ASTM Specification A234, with pressure rating not less than 150 PSI.

2.4 STATION DISCHARGE ISOLATION VALVE

- A. Isolation gate valves shall be of bronze construction, US Manufacture, 600 WOG with steel cross handle and 200 psi rating as manufactured by NIBCO, Hammond Valve, Watts or approved equal.

2.5 PRESSURE GAUGE

- A. Pressure gauge shall be located downstream of the pump for easy reading of the discharge pressure. Pressure gauge shall be 304 stainless steel case and bezel construction. Gauge shall be 2-1/2" diameter, liquid filled. Pressure sensing connection shall be 1/4" NPT lower gauge connection.

2.6 GENERAL PANEL

- A. The low voltage control panel assembly shall be built in accordance with the provisions of the National Electrical Code and shall bear the U.L. listing mark for NEMA 1 industrial control panels along with the pump station manufacturers' U.L. panel shop file number. The control panel will be mounted inside the station enclosure and contain terminal blocks, relays, and HOA switch.

2.7 MAIN STATION DISCONNECT AND FUSING

- A. A three-pole, service rated main station disconnect shall be mounted in a separate NEMA 4 enclosure outside the pump station enclosure to completely isolate the pump station electrical system from incoming power.

2.8 PRESSURE TRANSDUCER

- A. A solid-state pressure transducer shall provide a noise free, linear output proportional to discharge pressure. Transducer shall be solid state, strain gauge type with integral voltage regulating and output accuracy not less than 0.5%. Transducer shall be constructed of stainless steel and rated for the maximum pump station discharge pressure.

2.9 VARIABLE FREQUENCY DRIVE (VFD)

- A. The variable frequency drive shall be IGBT based with selectable carrier frequency up to 15 KHZ. The VFD shall include terminals for incoming power, motor output power and control terminals. The VFD shall generate a sine-coded, variable voltage/frequency, three-phase output for optimum speed control. The VFD shall incorporate power loss ride-through. VFD protective features shall include current limit, short circuit protection, electronic motor overload protection and ground fault protection. The VFD shall have push button programming display for easy access to operation parameters. VFD must be designed for operation in 50 degree C temperature condition.

2.10 CONTROL ALARMS

- A. Low System Pressure Safety Shutdown
 - 1. When the station discharge pressure remains below an adjustable set point for more than 2 minutes, the pumps will be de-energized and remain so until the alarm is manually reset. The Low Pressure alarm will be indicated on the processor display.
- B. High System Pressure Safety Shutdown
 - 1. When the station discharge pressure remains above an adjustable set point for 2 minutes,

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the pumps will be de-energized and remain so until the alarm is manually reset. The High Pressure alarm will be indicated on the processor display.

C. Motor Overload Shutdown

1. If the over current condition lasts longer than the pre-programmed limit the motor will be de-energized and remain so until the alarm is manually reset. The overload alarm will be indicated on the processor display.

D. VFD Fault Shutdown

1. The VFD shall sense additional internal faults that will cause the VFD to shutdown for system protection. These faults will be indicated on the processor display.

2.11 LIGHTNING ARRESTOR

- A. The main power supply to the pump station shall be equipped with a secondary lightning arrestor having a breakdown current rating of not less than 60,000 Amps at 14,000 Volts discharge. Power supplies 300 Volts and less shall use a 300 Volt arrestor with an 800 Volt spark-over Voltage. Power supplies up to 600 Volts shall use a 600 Volt rated arrestor with a 1,000 Volt spark-over Voltage.

2.12 SUBMERSIBLE PUMP WIRE

- A. Wire for submersible pump shall be three conductor plus ground twisted submersible cable. Conductors shall have PVC insulation and be colored black, red, yellow and green. Conductors shall be rated 600V, type THW submersible cable. Cable shall be UL Listed. Cable shall be properly sized for the pump horsepower.
- B. Wire type and method of installation shall be in accordance with local codes for NEC circuits of 600-volt A.C.

2.13 ELECTRICAL CONDUIT

- A. Conduit for below ground wiring shall be PVC Schedule 40, sizes as indicated on the drawings and details.

2.14 WELL PUMP ENCLOSURE

- A. The well pump enclosure shall be of a vandal and weather resistant nature manufactured entirely of marine grade aluminum alloy 5052-H32, with a wall thickness of one eighth inch. The mounting base shall be manufactured entirely of stainless steel.
- B. The main housing shall be of solid sheet construction with screened louvers for ventilation. The enclosure shall be a center split design, having mounting lips on each end. The mounting base shall be submerged into the concrete a minimum of two inches, positioning the enclosure one and one half inches above the concrete for drainage purposes. Enclosure shall have a flexible rubber skirt to prevent wind intrusion.
- C. The locking mechanism shall be of the full release type which allows for complete removal of the enclosure from its mounting base without the use of tools. The locking mechanism shall be a Stainless Steel Cross Bar style and provide for a padlock.
- D. Enclosure shall be 72-inches long by 65-inches wide by 60-inches tall as manufactured by Hubbell Power Systems, model LB8000AET or approved equal.

2.15 CHECK VALVE

- A. Check valve shall be of brass or bronze construction and be swing type opening when water is flowing in the designed direction and closing when water reverses flow or flow stops. Check

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valve shall be rated 200-psi WOG.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Consultant shall make frequent observations of the Contractor's work while such work is in progress. The Consultant shall bring to the attention of the Contractor any work which does not meet the specifications of the contract and the Contractor shall correct such work as brought to his attention.
- B. The well drilling contractor shall be responsible for providing and installing the proper well casing and screen for the geology encountered.

3.2 PUMP INSTALLATION

- A. Well pump shall be installed in well per AWWA standards and utilize proper torque arrestors as required. Pump shall be wired to the control panel and piped to the control components as shown on the Drawings.

3.3 ISOLATION VALVE, PRESSURE TRANSDUCER, PRESSUR GAUGE, CONTROL PANEL

- A. Pump discharge isolation valve, check valve, pressure transducer and control panel shall be installed in pump enclosure as shown on the Drawings.

3.4 TESTING AND SYSTEM

- A. Testing System: Upon completion of the pump system, the entire system shall be tested for proper operation. All air will be flushed from the system and the Contractor will check all components for proper operation.
- B. Adjustment: The Contractor shall adjust the various components of the pump system so the overall operation of the system is most efficient.
- C. Operational Testing: Perform operational testing after irrigation system is completed and connected to the pump system. Demonstrate to Owner that the completed system meets operational requirements and that automatic controls function properly.
- D. Notice of Substantial Completion: When the Contractor is satisfied the system is operating properly, and all work and clean-up is completed, then he shall issue the notice of substantial completion to the Owner no less than ten (10) working days prior to requested review. The notice of completion shall include the request for final inspection on which date and time will be given.
- E. Final Inspection with Consultant: The Consultant will respond to the notice of completion by the Contractor and shall appear at an agreed upon time for the final inspection. The Consultant shall note any inconsistencies on the plans or specifications and a written copy of corrections shall be given to the Contractor.
- F. Guarantees: The Work included under this contract shall be guaranteed by the Contractor against all defects and malfunctions due to faulty workmanship or defective material for a period of one year from the date of substantial completion as deemed by the Owner. Upon being informed by the Owner of any defects or malfunctions, the Contractor shall make all necessary repairs and/or replacements within 48 hours maximum at no additional cost to the Owner. The Owner may make emergency repairs, when necessary, without relieving the Contractor of his guarantee obligation. The Contractor shall be obligated to repair any settling of backfilled trenches, which may occur during the guarantee period. The Contractor is also obligated to

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restore any and all damaged plantings, paving, or improvements due to trench settlement or repairs within the year period.

3.5 CLEANING AND ADJUSTING

- A. Upon completion of all installation Work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

3.6 ACCEPTANCE AND OPERATION BY OWNER'S REPRESENTATIVE

- A. The Contractor shall provide and keep up to date a complete set of record drawings.
- B. Upon completion of the work, the Contractor shall furnish the Owner with a complete set of record drawings showing the well pump system as installed.
- C. The Contractor shall furnish, in addition to the Record Drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the pump system. The Contractor shall guarantee all parts and labor for a minimum period of one (1) year from date of substantial completion.

END OF SECTION 32 84 10

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SECTION 32 92 00 – ATHLETIC FIELD TURF AND GRASSES

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 SCOPE

- A. Furnish all labor, materials supervision and equipment necessary to install “Big Roll” Certified Tifway Bermuda 419 Sod on top of completed playing fields (Prepared Root zone growing median).
- B. The work specified in this section consists of the establishing of a consistent, dense, healthy stand of playing field sod within the areas specified on the drawings. The work shall consist of mechanical raking, final floating, preparing the subgrade and incidental earthwork for natural playing fields, unloading and placing of the sod, watering, and maintaining the sodded areas through sod establishment satisfactory to the Owner.

1.3 SUMMARY

- A. Section Includes:
 - 1. Supplying, preparing, and installing playing field root zone mix.
 - 2. Preparing finish grade for playing field sod. Mechanical Raking and final float.
 - 3. Installation and laser grading of playing field root zone mix to design finish grade on playing field.
 - 4. Installation playing field sod.
 - 5. Supplying and applying fertilizers and soil amendments on playing field sod.
 - 6. Replanting unsatisfactory or damaged playing field sod
 - 7. Maintenance for playing field sod
 - 8. Warranty for playing field sod
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, rough grading, and fine grading.

1.4 DEFINITIONS

- A. Finish Grade: Elevation of finished surface on playing field.
- B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

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- C. 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.
- D. 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.
- E. 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.
- F. Playing field Root Zone Mixture: Existing native surface topsoil or imported soil that is modified with soil conditioners, sand, and fertilizers to produce a soil mixture best for plant growth.
- G. Sand: Comply with USGA specifications for compaction and percolation or equivalent. Sand shall be weed, disease, and insect free. Use as a top dressing material if needed to meet smoothness requirements.
- H. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- I. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- J. Surface Soil: Soil that 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.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- Certification of Sod: From vendor for sod stating the botanical and common name, to source of sod including name and contact information of grower.
- 1. Sod shall be Certified Tifway Bermuda 419 Sod. Certification tag shall accompany sod.
- C. Qualification Data: Data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of landscape architects and owner, and other information specified.
 - D. Product Certificates: By product supplier for soil conditioners, fertilizers, limestone, Ron Star, and sand.

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- E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 2. The contractor shall correct deficiencies in the topsoil. Retesting cost shall be at the Contractor's expense.
 - 3. Provide complete physical and particle size analysis of imported soil materials, soil conditioners, and existing surface soil and/or imported topsoil (randomly selected cores in playing field areas) by an independent testing lab. State on sampling the variety of sod to be installed. If there are multiple existing surface soil types on fields, provide and test each type.
 - 4. Provide playing field root zone mixture (sand, processed peats, root zone mixture) test by an independent testing lab.
 - 5. Provide pH, organic content, and lime recommendation test on additives required to establish satisfactory pH for planting by an independent testing lab.
 - 6. Provide complete chemical analysis and cation exchange capacity test of soil conditioners (MSDS sheet) by an independent testing lab.
 - 7. Provide fertilizer recommendation test by an independent testing lab.
 - 8. Furnish and coordinate a one-gallon sample of on-site surface soil, topsoil, soil conditioners, and sand to the testing lab. Contractor shall pay all testing expenses.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of sod during a calendar year. Submit before expiration of required initial maintenance periods.
- G. Provide a testing, planting, and maintenance schedule for sod installation during construction period.

1.6 QUALITY ASSURANCE

- A. Sod Grower: Grower shall have a minimum of 5 years experience in certified Bermuda production.
- B. Installer Qualifications: Engage a Contractor with at least 5 years experience who has completed a minimum of 20 playing field projects similar in material, design, size, and scope to that indicated for this project and with a record of successful sod establishment.
 - 1. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Land care Network:
 - a. Certified Turfgrass Professional, designated CTP (Sports Field Manager).
 - 2. Pesticide Applicator: State licensed, commercial.
- C. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

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1. Preferred Testing lab is Tifton Physical Soil Testing Lab (229) 382-7292. Allow 10 working days in schedule for testing. Testing shall be performed working 10 days prior to delivery of topsoil, soil conditioners and sand to site.
- D. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each existing surface soil or imported topsoil to be used or amended for planting purposes.
 3. Report suitability of tested soil for sod growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) 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, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- E. Preinstallation Conference: Conduct conference at Project site.
 1. Proceed with installation of sod only after approval of finish grade by Architect or Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. All sod transported by open truck shall be adequately covered to prevent windburn, drying out or any other wind damage to the sod. Any sod not placed within 24 hours of harvesting shall be rejected and removed from the site immediately at the expense of the Contractor.
- B. Any of the delivered Certified Tifway Bermuda 419 Sod which is damaged through any action or inaction of the Contractor shall be replaced. The cost for re-supplied and replaced sod (directly due to the Contractor's negligence) shall be paid for by the Contractor directly.
- C. Deliver approved lots of the playing field root zone mix in clean, washed and covered trucks to eliminate contamination during transportation. Stockpiling of the material on site is to be coordinated by Contractor. The material shall be placed in an area free from contamination such as low wet areas and or refuse and debris areas.
- D. The Architect reserves the option to visually inspect every load of playing field root zone mix delivered to the site for excessive contamination and obvious clumps of peat not properly ground into the blend. If samples appear to be contaminated or visually different from a uniform blend, a sample shall be sent to the Root Zone Testing Agent for testing. If the sample fails to meet the

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specifications then the Architect will reject the balance of the failed mix. The rejected material shall be removed, disposed off site in a legally approved waste area and replaced by the Contractor immediately at no cost to the Owner.

E. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing sod areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.8 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
1. Spring Planting: April 15 – October 1.
 2. The Contractor is responsible to plant and remove any temporary seed mixture required for erosion control purposes, in the event planting schedule is missed, and permanent planting is delayed until the next available planting season.
 3. The Contractor may submit to the Architect for consideration a written request for a variance if the planting schedule is missed.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.9 MAINTENANCE SERVICE

- A. Initial Sod Maintenance Service: Provide full maintenance by Contractor. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable sod is established but for not less than the following periods:
1. Sodded Turf: 75 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if sod is not fully established, continue maintenance during next planting season.
 2. Maintain and establish playing field sod by watering, fertilizing, weeding, spot weeding applications of herbicides, fungicides, insecticides, pre-emergence, post-emergence, mowing, trimming, replanting, and other complete weed control operations. Roll, regrade, reshape, recompact, topdress with sand, and replant bare or eroded areas to

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produce a uniformly smooth sod, free of weeds, undesirable grass species, disease and insects.

- a. Replant bare areas with same materials specified.
 - b. When directed by the Architect, Contractor shall top-dress playing field sod areas as described in Section 886 of NCDOT Standard Specifications for Roads and Structures. Topdressing will be required during the grow-in period if sod fails to establish or establishes slowly and surfaces becomes un-smooth, and as a result of erosion, improper finish grading, and settling of the finish grade. Topdressing material is sand defined in Section 2 herein.
- B. 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 SOD

1. The sod shall be a nursery grown sand based Certified Tifway Bermuda 419 which shall be purchased by the Contractor and delivered by the sod farm to the site for unloading by the Contractor. It shall be a machine cut sod at a uniform thickness of ½" excluding top growth and thatch. The sod farm's sand material base shall be a soil medium that is compatible with the installed playing field root zone. Also the sod farm's sand soil medium shall be a free draining material acceptable to the Architect in particle size and soil characteristics.
2. Provide sod samples from the proposed sod farm supplier. Samples shall be submitted by the sod farm to the Contractor for testing and approval (with reports issued to both the Owner and the Architect) prior to the acceptance of the sod farm.
3. Sod shall be locally sand grown Certified Tifway Bermuda 419, machine cut and taken up in commercial size (big) rolls 42 inches wide by 75 feet long. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh, and uninjured at the time of planting. It shall have a soil mat of sufficient and consistent thickness of ½" below the thatch layer adhering firmly to the roots to withstand all necessary handling. The sod shall be 18-24 months old.
4. Sod farm harvesting procedures shall be so that uniformity of the cut is obtained. Edges shall be cut at 90-degree angles using constant sharp blades. The thickness and width shall be kept to strict dimensions. The Contractor shall protect sod against the drying and breaking of rolled strips at the site.
5. The sod shall be subject to review and approval by the Architect and the Contractor prior to being cut at the Sod Farm and once again before it is installed on the playing field. The Architect shall have the right to take samples of the sod from the selected sod supply field and submit them for DNA genetic identification and verification. The Architect shall have the right to test the delivered sod at the playing field to insure consistency with the DNA genetic identification benchmarks.
6. Each roll of the Certified Tifway Bermuda 419 Sod shall be free of noxious weeds and other objectionable plants and shall not contain thatch quantities and substances injurious to growth.
7. See plan for limits of planting.
8. Local supplier: American Turf, Creswell, NC, Chris Leary 252-331-3500.

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2.2 PLAYING FIELD ROOT ZONE MIXTURE

- A. The Contractor shall supply the growing medium soil for the sod on each playing field, which shall be a custom blended sand and organic matter mixture (option A or B below).

The imported sand shall be free of organic and foreign materials, roots, plants, grass, stones, clay lumps, and other extraneous material harmful to plant growth. It shall conform to the following Particle Size Criteria as shown in Table 1.

Table 1. Particle Size Distribution of USGA Root Zone Sand

SIZE	SIEVE MESH	PARTICLE DIAMETER (MM)	RECOMMENDATION (BY WEIGHT)	
Gravel	10	2.0-3.4	Not more than 10% of the total particles in this range, including a maximum of 3% fine gravel (preferably none)	
Very Coarse Sand	18	1.0-2.0		
Coarse Sand	18	0.5-1.0		
Medium Sand	60	0.25-0.50	Minimum of 60% of the particles must fall in this range	
Fine Sand	100	0.15-0.25	Not more than 20% of the particles may fall within this range	
Very Fine Sand	270	0.05-0.05	Not more than 5%	Total particles in this range shall not exceed 10%
Silt		0.002-0.05	Not more than 5%	
Clay		Less than 0.002	Not more than 5%	

Table 2. Physical Properties of the Root Zone Sand

PHYSICAL PROPERTIES	RECOMMENDED RANGE
Total Porosity	35-55%
Air Filled Porosity (40cm Tension)	15-30%
Capillary Porosity	15-25%
Bulk Density	1.2-1.6 g/cc
Saturated Conductivity	9-18 inches/hr
Organic Matter Content (by weight)	1-5% (ideally 2-4%)

- B. Option A – Supply, blend and place processed Imported Spagnum Peat, which will be derived from a freshwater site with the imported sand to make sportsfield rootzone mixture. Include cost of purchase, transportation, and installation in bid. Shred and granulate peat to pass sieve analysis and condition in storage piles for a minimum of 6 months after excavation. Minimum organic matter content of 85% by weight as determined by loss on ignition (ASTM D2974-87 Method D). Peat shall be free of sticks, stones, and other debris and comply with the following as shown in Table 3.

Table 3. Organic Matter for Sand – Root Zone Mix

ITEM	CRITERIA
Total Ash	15% or less
pH	6.5 to 7.5
% Moisture	30% to 50%

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Fiber Content	20% to 50%
Sieve Size 2.0 mm	95-100% Passing
Sieve Size 1.0 mm	Greater than 80% Passing

- C. Option B- Supply, blend and place 100% Imported Compost Soil Conditioner with imported sand to make sportsfield rootzone mixture: Compost shall have U.S. Compost Council Seal of Assurance and shall meet the following criteria: Include cost of purchase, transportation, and installation in bid.

Typical soil report analysis:

CEC: 75-95 P index range: 118-106 K index range: 165-230
PH range: 6.7-7.3 Ca index: 92-95% Mg index range: 5-8%
SS index: 95-210 micro-nutrients index: (Mn, Zn, Cu, S) 85-160

Compost is made by combining turkey manure, cotton gin mote, and wood chip bulking agents. These ingredients are composted under cover 3 to 4 months with computers monitoring the moisture and air content to provide optimum conditions for composting. The compost is then cured for another 4 to 6 months, then screened with a 5/8" to 3/8" square screen. While composting this high nutrient, high Ca material obtains temperatures ranging from 135-150 degrees F that helps eliminate weed seeds and pathogens.

1. Triangle Landscape Supplies (Or equal)
Raleigh, NC
919-553-1118
 2. Greensmix (USGA 85%/15% or custom blend)
Contact: Rob Hamrick
Rockingham, NC
828-230-2417
 3. Morgan Sand Company (USGA Greensmix 85%/15% or custom blend)
High Point, NC
336-869-9550
 4. Or equal, proposed soil conditioner is subject to approval by Architect. Contractor is responsible for submitting a sample of the mixture to independent testing lab for suitability testing and for paying the testing fee.
- D. Contractor shall estimate quantities needed to achieve the finish design grade for each playing field indicated on the plans and to obtain a root zone mixture to depths indicated on the plans per detail 5 on Sheet C-6.4. In addition to using imported sand provide a minimum of 1 inch (134 cubic yards per sod acre) of imported compost soil conditioner or imported peat. Finish laser grading of the playing fields is by the Contractor.
- E. Furnish the Root Zone Mixture (Options A or B) performance meeting the following USGA physical evaluation protocol. Water retention shall be 30 cm tension. Tests shall determine compliance with specified mixing ratio and provide calibration data for the quality control program. Tests shall comply with the following criteria on a core compacted to 14.3 ft-lbs/inches squared.

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TEST REQUIREMENT	PERFORMANCE
Infiltration Rate Inches/hour	12 to 20
Bulk Density, grams/cc	1.2 to 1.6
Total Porosity, percent	35 to 55%
Saturation percentage @ 30 cm tension	35 to 65%
Organic Matter Dry Weight	0.5% to 1.7%

- F. Furnish a Root Zone Mixture (Options A or B): Organic range of 0.4 to 0.6% organic matter on a dry weight basis. Approximately a 80-85% sand/15-20% soil conditioner or peat ratio. The sand/peat or soil conditioner mix shall be mixed on site to uniform consistency. Percentage of peat in the sand peat mix will be as determined through laboratory testing using performance criteria as outlined above. Root zone mixture shall consist of a non-calcareous washed processed sand and a processed peat.

2.3 IMPORTED SAND: Unit Price No 16

- A. Payment for imported sand will be on a unit price basis. Sand shall meet USGA requirements. Contractor is responsible to test, supply, blend and place imported processed sand for each playing field. The processed sand shall meet the requirements of Table 1 and 2 included in this specification.
- B. Contractor shall submit a sample of the imported processed sand to the independent testing lab for suitability testing and pay the testing fee. Include the cost of purchasing the sand, transportation of it to the site, on-site blending, and placing of the sand/peat or soil conditioner in the unit price.

2.4 INORGANIC SOIL AMENDMENTS - The Contractor is responsible to test the blended sand soil mixture and remedy deficiencies found in the soil test by mixing in inorganic soil amendments to create a suitable root zone mixture.

- A. Limestone is used to raise pH and neutralize acidic soils.
- B. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Provide lime in form of ground dolomitic limestone.
- C. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- E. Aluminum Sulfate: Commercial grade, unadulterated.

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2.4 FERTILIZERS-The Contractor is responsible to test the blended sand soil mixture and remedy deficiencies found in the soil test by mixing in fertilizer to create a suitable root zone mixture.

- A. Organic fertilizers are derived from several sources. Bonemeal in first paragraph below is organic and primarily phosphorous, has an alkaline reaction, and is nonburning. Other organic fertilizers include blood meal, cottonseed meal, seaweed meal, soybean meal, alfalfa meal, and blends of these materials.
- 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. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- E. Slow-Release Fertilizer: Granular or pelletized 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.

2.5 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.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
 - 1. Ronstar (verify with sod supplier if needed)
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.6 WATER

- A. Water: Potable:

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall submit a one (1) gallon sample of the root zone mix to the testing lab specified herein for testing including particle size distribution, infiltration performance and organic matter determination. This shall be done prior to the commencement of the delivery of the root zone mixture to the playing field site. Contractor will also be financially responsible for re-testing if the mix does not meet these specifications.
- B. The Contractor shall submit test results to Architect for approval. The Contractor may begin delivery of the approved material after approval from the Architect.
- C. Examine playing field subgrade areas for compliance with requirements and other conditions affecting performance.
 - 1. 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 soil.
 - 2. Do not mix or place soils or soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and mixing operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
 - 5. Verify with Architect and Owner subgrade meets smoothness requirements.
 - 6. Verify all areas to be sodded have positive drainage.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. If contamination by foreign or deleterious material or liquid is present in subgrade within a playing field area, notify the Architect within 24 hours for direction.
- F. Proceed only when automatic irrigation system or hand watering systems are operable.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by fine grading and sodding operations.
- B. Protect grade stakes set by others until directed to remove them.
- C. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Remove all temporary grassing or weeds with herbicide.

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3.3 ROOT ZONE BLENDING, PLACING, AND FINE GRADING

- A. Limit sod subgrade preparation to playing fields including the sideline area.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 8 inches (200 mm). Remove all construction gravel regardless of sizes, stones larger than 1/4 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property. Make a minimum of two passes in opposite directions over the initial grade with a rock hound or similar equipment if needed.
 - 1. The Contractor shall place and spread the root zone mixture over the previously contractor rough graded playing field surface to a one-inch depth over the subgrade. Extreme care must be exercised to coordinate and sequence work so that there is no damage caused to both the to the irrigation systems (if installed prior to root zone mixture placement-preferred sequence) by any of the equipment used during the root zone soil mix hauling and spreading operations. Material shall be installed in a moist condition. Root zone mixture shall be installed within 1/4" on 25 feet either direction plus or minus of finish grade elevation shown on the Grading Plans when compacted. Move the root zone mix from the stockpile in such a manner that contaminated materials are not tracked onto the field from the equipment tracks or tires. If determined by the Architect that contamination is occurring, on-site samples will be taken and tested by the Root Zone Testing Agent at the expense of the Contractor. Any contamination or over compacted conditions will require immediate action by the Contractor to satisfy the intent of these specifications with no additional cost to the Owner.
 - a. Delay mixing imported soil conditioner or peat if planting will not proceed within a few days.
 - a. Apply lime, superphosphate, and fertilizer at rates indicated in soils test.
 - b. Mix and Blend root zone mixture, lime, fertilizer, and superphosphate thoroughly into the top 2-3 inches of each playing field subgrade. Till/mix two times in opposite directions.
 - c. Fine grade and smooth surface area to achieve finish grades shown on plans using laser controlled, hydraulically activated land planes, tractors, disc harrows, blecavators, and other specialized playing field equipment. Hand rake the entire playing field including sidelines to meet smoothness requirements if necessary. Field compaction shall not exceed bulk density as performed in laboratory testing.
 - d. In addition to the root zone mixture preparation, each playing field shall have no high or low spot greater than 1/4 inch in 10 feet. The Contractor shall correct any deviation in the finish grade. Loosening, adding or removing material, reshaping, compacting, rolling and top dressing with USGA sand as directed by Architect may be required at no additional cost for a deficient playing field surface.

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- e. In no case shall water be allowed to pond on playing fields. Provide positive drainage into swales drainage structures, or by surface flow over land (No birdbaths).
 - 2. Moisten areas to be sodded before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
 - 3. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.
 - 4. Finished grade for playing field sod areas shall include existing soil, soil amendments, sand, and soil conditioner.
- 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 (13 mm) 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.
- 1. The Contractor shall provide all staking and layout for grade control so that the finished design plan grades will be met through the use and employment of the fully automated hydraulically actuated, laser guided equipment
 - 2. The Contractor shall verify grades established during the final laser finish grade preparation prior to the beginning of sod installation as being true finish contours shown and maintain such areas until the effective date to begin sodding operations. It shall be the responsibility of the Contractor to maintain a suitable grade for sodding, including but not limited to hand grading (to string line) if required, once the Architect has inspected and approved the final finish grade.
- 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 sod, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SOD INSTALLATION

- A. Installation of Sod: The entire playfield root zone area for each playfield shall be approved by the Architect in writing prior to commencing with the sod installation. The areas to receive sod shall be firm, and the irrigation systems shall be operational. Lay sod within 24 hours from the time of harvesting. The Architect will reject sod not placed in 24 hours with no exceptions allowed. The Contractor shall pay for the cost of replacing the rejected sod.
- B. During the sod installation work the Contractor shall maintain final elevations as per the design through the use of floating, hand raking, dragging, or whatever else approved leveling operations are necessary and required.
- C. Absolutely no forklift or heavy surface equipment shall be allowed on the finish graded root zone surface. Machines properly sized in weight equipped with high flotation sod tread tires or rubber tracks shall install sod. The machines shall be operated at speeds so as to not disturb the previous

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ly established finish grades. Any and all areas disturbed by the Contractor shall be hand raked back to the project finish grades prior to the installation of the sod on that said area or areas.

- D. The Architect reserves the right to be on site daily to observe the installation of the sod. All defects shall be repaired or replaced by the Contractor immediately. The Architect's sole judgment shall determine any rejection, replacement, and repair of the daily installed sod.
- E. The sod shall be laid on a moist planting bed to ensure the new roots have exposure to adequate water for optimum growth. The rolls shall be fitted together as tightly as possible and all cracks between the sod roll seams shall be filled by hand with the root zone sand mixture. Tamp or roll the sod to remove air pockets and ensure close contact between the sod and root zone material.
- F. The Contractor shall install the sod with the first roll laid in a straight line with subsequent rolls placed parallel to and tightly against each other. The roll end lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all the seams are tight in order to prevent holes. All netting shall be removed from the roll sod as it is being installed. Absolutely no netting shall remain under and between the rootzone and the sod soil mat.
- G. Watering of the sod shall occur immediately after the installation of each row of sod to prevent excessive drying during the progress of the work. Use a hand held water hose with a spray nozzle to accomplish sod watering. Water to a depth of one (1) inch below the new sod pad as the sod installation is completed in any section of each playing field.
- H. Seams and Joints: After laying and rolling the sod, fill all joints and seams by hand with root zone sand mixture. Wash in with the hand held water hose any excess material to avoid smothering the sod. Thoroughly water all seams to verify that all have been properly filled with the root zone material.
- I. No equipment or vehicles operated by anyone on the job site shall be allowed to travel over the sodded areas after installation. Absolutely no exceptions will be allowed to this requirement.
- J. Contractor shall roll the sod with a mechanical roller of no less than three (3) tons as sodding is completed in any one section. All sod areas will be rolled to provide an even sodded appearance with no high and low points and to insure good sod to soil contact. The sod shall be rolled in two directions which are perpendicular to each other.
- K. Immediately following the rolling operations the sod shall be thoroughly irrigated to a depth sufficient so that the underside of the sod pad and soil immediately below the sod are thoroughly wet.
- L. Rolling will be done in accordance with the Architect's recommendations and requirements.

3.5 PLAYING FIELD MAINTENANCE

- A. Maintain and establish sod by watering, fertilizing, weeding, mowing, trimming, replanting, topdressing, and performing other operations as required to establish healthy, viable playing fields. Roll, regrade, and replant bare or eroded areas to produce uniformly smooth playing fields. Provide materials and installation the same as those used in the original installation.

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1. Fill in as necessary root zone mixture subsidence that may occur because of settling or other processes. Replace materials and sod damaged or lost in areas of subsidence.
 2. Apply treatments as required to keep sod and root zone mixture free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazard
- B. Watering: Provide, install and maintain temporary piping, hoses, and sod-watering equipment or use the new irrigation system to convey water from sources and to keep sod uniformly moist to a depth of 4 inches (100 mm).
1. Schedule watering to prevent wilting, puddles, erosion, and displacement of sod. Lay out temporary watering system to avoid walking over muddy or newly sodded areas.
 2. Water sod immediately after planting, then apply water as follows:
0-75 days As needed to maintain acceptable sod.
- C. Mow sod as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of sod height. Remove no more than 1/3 of sod-leaf growth in initial or subsequent mowings. Do not delay mowing until sod blades bend over and become matted. Do not mow when sod is wet. Schedule initial and subsequent mowings to maintain the following sod height:
1. Maintain sod at a height of 2 inches (50 mm) during the first 60 days of the maintenance period.
 2. Maintain sod at a height of 1.5 inches during the final 15 days of the maintenance period..
- D. Sod Post fertilization: Apply fertilizer after initial mowing and when sod is dry.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to sod area.
- E. Pre-emergent: Apply Ronstar to each playing field at a rate of 2.5 lbs active ingredients on a fertilizer carrier immediately after planting sod if recommended by the sod supplier. Apply water within one hour after Ronstar application.
- F. Maintain sod weed free during the maintenance period.

3.6 SATISFACTORY SOD

- A. Sod installations shall meet the following criteria as determined by Architect.
1. Playing fields will be acceptable provided all requirements, including maintenance, have been completed and smooth, healthy, uniform, dense stand of sod is established, free of weeds, undesirable grass species, disease and insects for one full growing season (assume 75 days).
 2. Playfields shall have no bare spots. Provide full ground coverage (100% of surface area).

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3. Use specified materials to reestablish sod that does not comply with requirements and continue maintenance until sod is satisfactory.
4. An acceptance inspection shall be performed by the Architect at the request of the Contractor to observe if the Contractor has completed the sod installation to the satisfaction of the Architect before and at the end of the maintenance period. The Contractor shall notify the Architect for playing field inspection

3.7 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.8 SETTLEMENT

- A. Maintain finish grades shown on the drawings, and deposit whatever root zone sand mixture top dressing or rolling may be required to correct any settlement or erosion that occurs until the end of the maintenance period. The surface upon which additional topdressing is to be deposited shall be raked or otherwise satisfactorily prepared to ensure a proper bond. Fill depressions that develop from settling, rutting, or mowing to the finished elevations, with topdressing material.

3.9 TOPDRESSING

- A. If playing fields do not have the level of smoothness specified herein or have depressions, rutting, or if mowers or other equipment cause rutting, then additional top dressing material and rolling will be required to correct the uneven grade at the Contractor's expense. Top dressing material will be as specified in the playing field maintenance section of these specifications.

3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by sod work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly sodded areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after sod established.
- C. Remove all non-degradable erosion-control measures after the sod establishment period.

END OF SECTION 32 92 00

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SECTION 32 92 10 – NON-ATHLETIC FIELD TURF AND GRASSES

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. Fine grading and preparing non-athletic field lawn areas.
2. Furnishing and applying topsoil to non-athletic field lawn areas.
3. Furnishing and applying soil amendments to non-athletic field lawn areas.
4. Furnishing and applying fertilizers to non-athletic field lawn areas.
5. New seeding for non-athletic field lawn areas.
6. Replanting unsatisfactory or damaged non-athletic field lawn areas.
7. Erosion control material(s).
8. Maintenance for new non-athletic field lawn areas.
9. Warranty for new non-athletic field lawn areas.

- B. Related Sections:

1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, rough grading, and fine grading.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. 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.
- D. 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.

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- E. 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.
- F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- G. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- H. Surface Soil: Soil that 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.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Seed shall be NC Crop Improvement Blue Tag Certified. Certification tag shall accompany seed.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing surface soil and/or imported topsoil. Testing shall be requested 15 working days prior to delivery of topsoil to the work site. Deficiencies in the topsoil shall be corrected by the contractor. Retesting cost shall be at the Contractor's expense.
 - 2. Provide randomly selected cores in non-athletic field areas of the site.
 - 3. State on sampling the variety of seed to be installed.
 - 4. Provide pH, organic content and recommendations on additives required to establish satisfactory pH for planting.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

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1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation and maintenance specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.
 - c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
 5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
 6. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) 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, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Preinstallation Conference: Conduct conference at Project site.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: 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.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: April 15 – August 15.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 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: 60 days from date of Substantial Completion.
 - a. 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.
- B. 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.

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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. Seed Species: NC Crop Improvement Blue Tag Certified seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full Sun: hybrid Bermuda.
 - 2. Seed Type: (Cynodon Dactylon) Savannah (Use coated seed): New varieties will be considered for review and approval.
 - 3. Seeding Rate: 4-6 lbs per 1,000 SF.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.

2.3 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

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1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.4 PLANTING SOILS

- A. Planting Soil, re-use surface soil stockpiled from onsite striping, with pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1/2 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 1. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): 50 lbs/ac.
 2. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): 500 lbs/ac.
 3. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): 1,000 lbs/ac.
 4. Amend soils in accordance with soil testing report recommendations.
- B. Sand: Comply with USGA specifications for compaction and percolation or equivalent. Sand shall be weed, disease, and insect free. Use as a top dressing material if needed to meet smoothness requirements.

2.5 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew and seed-free, light application (2,000-3,000 lbs/acre dried Coastal Bermuda hay with non-asphalt tack).
- B. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.6 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.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.7 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
 1. See drawings for location and material type and installation details.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. 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 soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 8 inches (200 mm). Remove all construction gravel regardless of size, stones larger than ½ inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.

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3. Spread planting soil to a depth of 6 inches (50 mm) 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. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top [2 inches (50 mm)] of subgrade. Spread remainder of planting soil.
 - C. 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 8 inches (200 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches (150 mm) of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
 3. Remove stones larger than 1/2 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.
 - D. 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 (13 mm) 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.
 - E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
 - F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- 3.4 SEEDING
- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
 - B. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.
 - C. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
 - D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1 inch (76

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mm)] in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.5 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre (15.6-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.6 TURF RENOVATION

- A. Renovate existing turf.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
- I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new turf.

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- K. Water newly planted areas and keep moist until new turf is established.

3.7 TURF MAINTENANCE

- A. 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 mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow Bermuda to a height of 2 inches (50 mm).
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.8 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 100% full ground coverage.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

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3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of 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.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.10 SETTLEMENT

- A. Maintain ground top surfaces to the finish grades shown on the drawings and deposit whatever top dressing may be required to correct any settlement or erosion that occurs prior to the date of Final Acceptance. The surface upon which additional topdressing is to be deposited shall be raked or otherwise satisfactorily prepared to ensure a proper bond. Fill depressions that develop from settling, tire rutting, or mowing to the finished elevations with topdressing material.

3.11 TOPDRESSING

- A. If lawn areas do not have the level of smoothness specified herein or turf areas have depressions, tire rutting, or rutting caused by mowers or other equipment top dressing(s) will be required to correct the uneven grade at contractor's expense. Top dressing material will be sand as specified herein.

3.12 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove non-degradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

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SECTION 32 93 00 – PLANTS

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. Plants.
2. Planting soils.
3. Tree stabilization.

B. Related Sections:

1. Division 01 Section "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Division 31 Section "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. Division 31 Section "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
4. Division 32 Section "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

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- E. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- I. 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.
- J. 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.
- K. Planting Area: Areas to be planted.
- L. 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.
- M. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- N. 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.
- O. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- P. 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.
- Q. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- R. Surface Soil: Soil that 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.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.

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1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
- B. Samples for Verification: For each of the following:
 1. Trees and Shrubs: Three samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
 2. Organic Compost Mulch: 1-quart (1-liter) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 3. Mineral Mulch: 2 lb (1.0 kg) of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
 4. Tree Staking: Submit method and species to be staked.
- C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Material Test Reports: For existing in-place surface soil.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Landscape Contractor Qualifications: Installation must be by a NC Certified Landscape Contractor who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful tree and shrub establishment.
 1. Installer's Field Supervision: Installation must be by a NC Certified Landscape Technician on the Project site during times that tree and shrub planting is in progress.
 2. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

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- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. Representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) 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, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Architect of sources of planting materials seven days in advance of delivery to site.
- G. Preinstallation Conference: Conduct conference at Project site.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: 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 if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sunscald, drying, windburn, 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.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.
- F. 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. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

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1. Notify Architect no fewer than two days in advance of proposed interruption of each service or utility.
 2. Do not proceed with interruption of services or utilities without Architect's written permission.
- C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
1. Spring Planting: February 15 – April 15.
 2. Fall Planting: October 15 – December 15.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.8 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, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 2. Warranty Periods from Date of Substantial Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Two months.
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

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- d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. 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: Until final acceptance.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. 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: Until 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 Schedule or Plant Legend shown 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.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

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- E. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 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 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Provide lime in form of ground dolomitic limestone.
- B. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- C. Aluminum Sulfate: Commercial grade, unadulterated.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- E. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or 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.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15-lb/cu. ft. (2.4 kg/cu. m) of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25-lb/cu. ft. (4 kg/cu. m) of loose sawdust or ground bark.

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- 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. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. 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. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.5 PLANTING SOILS (NON ERICACEOUS PLANTS)

- A. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, 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 surface soil with inorganic and organic soil amendments and fertilizers to produce a planting soil with the following specified percentages of constituents:
 - 1. Use 50% of existing, in place surface soil (well pulverized).
 - 2. Use 10% of imported organic soil amendments
 - 3. Use 20% of imported silt.
 - 4. Use 20% of imported sand.
 - 5. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): 30 lbs.
 - 6. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): 100 lbs.
 - 7. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): per soils test.
 - 8. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): per soils test.

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- B. After producing the planting soil, the mixture shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than six percent (6%) organic matter, as determined by loss on ignition of moisture – free samples dried at 56 degrees centigrade.

2.6 PLANTING SOILS (ERICACEOUS PLANTS AND SEASONAL COLOR BEDS)

- A. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, 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 surface soil with inorganic and organic soil amendments and fertilizers to produce a planting soil with the following specified percentages of constituents:
 - 1. Use 33% of existing, in place surface soil (well pulverized).
 - 2. Use 33% of imported organic soil amendments
 - 3. Use 33% of imported sand.
 - 4. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): 30 lbs.
 - 5. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): 0 lbs (None).
 - 6. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): per soils test.
 - 7. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): per soils test.
- B. After producing the planting soil, the mixture shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than six percent (6%) organic matter, as determined by loss on ignition of moisture – free samples dried at 56 degrees centigrade.

2.7 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Pine straw.
 - 2. Color: Natural.
- 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 (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

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

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required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

- 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood or softwood with specified wood pressure-preservative treatment, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
- 2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles or compression springs.
- 3. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7mm) in diameter.
- 4. Tree Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

2.10 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWPAC2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. 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,

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- paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to the depth shown on the drawings or as required by local landscape ordinance, whichever is greater. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.

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- a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer (omit lime for Ericaceous plants and seasonal color beds).
3. Spread planting soil to the depth shown on drawings or as required by local landscape ordinance, whichever is greater, but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. 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.
 1. Excavate approximately three times as wide as ball diameter for balled and burlapped or container-grown stock.
 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 5. Maintain supervision of excavations during working hours.
 6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 7. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Subsoil and topsoil removed from excavations may be used as planting soil when amended per planting soil requirement specified herein.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

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- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before 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. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. 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. 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.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. 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.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. 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.

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3.6 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.

3.7 TREE STABILIZATION

- A. Contractor to stake trees and large shrubs as necessary to protect root balls from moving during grow in period and keep trunks plumb. Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Typing: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend to the dimension shown on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - 2. Use two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
- B. Staking and Guying: Securely attach no fewer than three guys to stakes 30 inches (760 mm) long, driven grade.
 - 1. Staking and Guying Method:
 - a. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle or compression spring. Allow enough slack to avoid rigid restraint of tree.
 - b. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - c. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.

3.8 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.

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- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 3-inch (75-mm) average thickness, with 36-inch (900-mm) radius around trunks or stems. Do not place mulch within 3 inches (75 mm) of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.10 EDGING INSTALLATION

- A. Separate mulched areas from turn areas, curbs and paving with a 45 degree, 4 to 6 inch (100 to 150 mm) deep, shovel-cut edge unless noted otherwise on drawings.

3.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- 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 whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

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3.12 PESTICIDE APPLICATION

- A. 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.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.13 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. 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.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.14 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 32 93 00

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SECTION 33 05 00 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping joining materials.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Identification devices.
 - 6. Grout.
 - 7. Flowable fill.
 - 8. Piped utility demolition.
 - 9. Piping system common requirements.
 - 10. Equipment installation common requirements.
 - 11. Painting.
 - 12. Concrete bases.
 - 13. Metal supports and anchorages.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. ABS: Acrylonitrile-butadiene-styrene plastic.
- D. CPVC: Chlorinated polyvinyl chloride plastic.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.

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1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Identification devices.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

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PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 (DN 40) and Smaller:
 - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
 - 2. Aboveground Piping: Specified piping system fitting.

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C. AWWA Transition Couplings NPS 2 (DN 50) and Larger:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.; DMD Div.
 - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - d. JCM Industries.
 - e. Smith-Blair, Inc.
 - f. Viking Johnson.
2. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

2.3 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

- A. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.
 1. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
 2. Color: Comply with ASME A13.1, unless otherwise indicated.

2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

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1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.
2. Density: 115- to 145-lb/cu. ft. (1840- to 2325-kg/cu. m).
3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
4. Aggregates: ASTM C 33, natural sand, fine.
5. Admixture: ASTM C 618, fly-ash mineral.
6. Water: Comply with ASTM C 94/C 94M.
7. Strength: 100 to 200 psig (690 to 1380 kPa) at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING INSTALLATION

- A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction

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loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

- 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 to permit valve servicing.
- 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. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

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- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
 - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.

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- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Stenciled Markers: According to ASME A13.1.
 - 2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
 - 3. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
 - d. At manholes and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 - 1. Lettering Size: Minimum 1/4 inch (6.4 mm) high for name of unit if viewing distance is less than 24 inches (610 mm), 1/2 inch (13 mm) high for distances up to 72 inches (1800 mm), and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

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3.8 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete".

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.10 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 33 05 00

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SECTION 332100 – STEEL CASING PIPES WITH SUPPORTS

PART 1 - GENERAL

101. WORK INCLUDED

- A. The CONTRACTOR shall provide all materials, labor, equipment, tools, etc., and perform all required work and services necessary for and incidental to a complete installation as shown on the drawings and specifications in complete accord with the CONTRACT DOCUMENTS.
- B. All supplementary or miscellaneous items, equipment, appurtenances, or devices necessary for or incidental to a complete and functional installation, whether or not shown on the plans or addressed in the specifications, shall be provided and installed as part of the WORK.
- C. Provide and install steel casing, carrier pipe and all appurtenances as shown in the plans or discussed in the CONTRACT DOCUMENTS.

PART 2 - PRODUCTS

201. CASING

- A. Only new casing will be used.
- B. The casing pipe shall conform to the materials standards of ASTM Designation A252, Grade 2 or approved equal. The diameter of the casing shall be as designated on the plans with the following corresponding thickness:

<u>Pipe Sizes (O.D.)</u>	<u>Wall Thickness</u>
4" - 12 ³ / ₄ "	0.188"
14"	0.219"
16" - 18"	0.250"
20"	0.281"
22"	0.312"
24"	0.344"
26"	0.375"
28" - 30"	0.406"

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32"	0.438"
34" - 36"	0.469"
38" -42"	0.500"

- C. The casing pipe shall be smooth wall steel casing of size and length specified, installed by open cut, and in conformity with lines and grades shown on the plans and as necessary to fit the installation conditions.

202. PIPE SUPPORTS

- A. Pipe supports shall be used to position the carrier pipe in the center of the casing pipe and to restrain the movement of the carrier pipe in all directions perpendicular to the pipe.
- B. Pipe supports shall be made of steel and be equal in design to SPIDER (brand) pipe supports by Spider Manufacturing Company of Durham, NC
1. Each support shall clamp around the pipe and have a minimum of four (4) support legs.
 2. Each support leg shall be equipped with skid feet which have front and back surfaces angled inwardly toward the collar allowing the carrier pipe to slide through the casing pipe.
- C. Pipe supports shall be coated with rust resistant primer and paint.
- D. Rubber liners shall be used inside the collars of the pipe supports when the carrier pipe is non-metallic.

PART 3 - EXECUTION

301. GENERAL

- A. Install in locations as shown in plans.
- B. Protect existing landscaping, conditions and features.

302. INSTALLATION

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- A. Casing shall be installed by open cut.
- B. Weld each section of casing to the preceding section installed.
- C. Install carrier pipe.
- D. Close up ends of casing with brick and mortar or manufactured end seals
- E. Backfill and compact.

END OF SECTION 332100

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SECTION 332110 – WATER PIPE AND PIPE FITTINGS

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

DESCRIPTION OF WORK:

The extent of work under this item includes providing and installing all pipe and pipe fittings as shown on the drawings and described herein necessary to make complete and serviceable the finished water main.

Related Work Specified Elsewhere:

Trenching, Backfilling and Compaction: Section 312200

Common Work Results for Utilities: Section 330500

Water Valves: Section 332120

QUALITY ASSURANCE:

General: Class numbers or pressure rating shall be clearly marked on the pipe and fittings at the factory. The materials used for the construction of water mains and all accessories and appurtenances thereof shall be new, free of defects in product and workmanship and of the highest quality available in the industry. Materials not specified but deemed equal to those specified may be approved for use provided the documentation and samples necessary for approval are provided to the Engineer thirty (30) days prior to the ordering of said materials. WRITTEN APPROVAL must be issued by the Engineer before such material may be used in construction. Current specifications (latest revisions) shall apply in all cases where materials are described by reference to published standards such as ASTM, AWWA, ANSI., etc.

Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.

AWWA: All applicable standards

North Carolina Division of Environmental Management: All rules and regulations

North Carolina Division of Health Services: All rules and regulations.

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SUBMITTALS:

Material Certificates: Provide notarized materials certificates signed by the material manufacturer. Certify that each material item complies with the specified requirements, and was purchased for this project.

Shop Drawings: Submit shop drawings on all flanged fittings.

PART 2 - PRODUCTS

Water Main and Fittings: Water mains shall be constructed of polyvinyl chloride (PVC) or ductile iron pipe (DIP) at the option of the Contractor, except in instances where the plans or the Engineer specifically requires a particular pipe material be utilized for an installation. All plastic pipe shall bear the seal of the National Sanitation Foundation.

2" & 3" PVC Pipe: PVC water main and services shall be PVC Class 200 SDR 21 conforming to the latest revisions of ASTM D 1784 and ASTM D2241 with "push-on" joints. Pipe shall be furnished in nominal twenty foot (20') lengths. Fittings for service pipe shall be schedule 80 PVC with solvent weld joints.

PVC Water Mains 4 Inches and Larger in Diameter: PVC water main 4 inches and larger shall be manufactured in accordance with AWWA Standard C900. The pipe shall have push-on type joints with elastomeric gaskets. The pipe shall be pressure rated at 150 psi with a dimension ratio of 18 for both bell and pipe thickness. Pipe shall be furnished in nominal twenty foot (20') lengths.

Ductile Iron Pipe: Ductile iron pipe for water mains shall be manufactured in conformance with AWWA C151 and shall be cement- mortar lined with an asphaltic coating in accordance with AWWA C104. The exterior of the pipe shall be bituminous coated in accordance with AWWA C-151. The minimum thickness Class of pipe shall be Class 50. Pipe shall be furnished in nominal 18 to 20 foot lengths. Pipe joints for ductile iron pipe shall be "push-on" unless the additional pipe deflection allowed by mechanical joints is necessary or other considerations dictate the use of mechanical joints. The joints for ductile iron pipe shall conform to AWWA Standard C111 revision (ANSI A21.11).

Polyethylene Encasement: Polyethylene encasement shall be applied to all underground ductile iron pipe and fitting installations. Materials and installation procedures shall be in accordance with ANSI/AWWA C-105/A21.5-88.

Fittings: Tees, elbows and other fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron unless otherwise permitted or required by the Owner. Standard dimension fittings or compact fittings may be used in accordance with the requirements of this Section.

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The interior of all fittings shall be cement mortar lined with an asphaltic coating in accordance with AWWA Standard C-104 (ANSI 21.4). The exterior of all fittings shall have a one (1) mil bituminous coating in accordance with AWWA Standard C-110 (ANSI A21.10).

Compact fittings shall be ductile iron with either push-on or mechanical joints in accordance with ANSI/AWWA C153/A21.53-84. Cement lining with an asphaltic coating shall be provided in accordance with ANSI/AWWA C104/A21.4.

"Push-on" joints shall be used unless the additional deflection allowed by mechanical joints or other considerations dictate the use of mechanical joints.

Standard dimension fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron with "push-on" joints unless the additional pipe deflection allowed by mechanical joints or other considerations dictate the use of mechanical joints. The fittings shall comply with all requirements of AWWA Standard C-110 (ANSI A21.10) and shall be designed for a minimum working pressure of 150 psi plus 100 psi surge pressure.

Restraint devices for use on ductile iron and C-900 PVC "push-on" joints: shall be constructed of high strength ductile iron, ASTM A536, Grade 65-45-12 and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Block Buster Series 1390-C, Star Pipe Products Allgrip series 3600 and Pipe Restrainers Series 1200S, or approved equal.

Restraint devices for use on mechanical joint to C-900 PVC: shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1500, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc GripRing or approved equal.

Restraint devices for use on mechanical joint ductile iron: shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1300-C, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc. GripRing or approved equal.

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JOINTS AND JOINTING MATERIALS FOR LARGE PIPE:

General: Where the joint type is not indicated on the drawings, either push-on or mechanical joints shall be furnished for buried pipe.

Ductile Iron:

Push-on joints shall conform to applicable requirements of AWWA C111 (ANSI A21.11). Gaskets and lubricants for pipe fittings shall conform to applicable requirements of AWWA C111 (ANSI A21.11).

Mechanical joints, including pipe ends, glands, bolts and nuts, and gaskets, shall conform to applicable requirements of AWWA C111 (ANSI A21.11).

Pipe capable of joint deflection of up to 5 degrees per joint shall be provided.

PART 3 - EXECUTION

GENERAL:

Adherence to Standards and Instructions: All pipe, of whatever material, shall be transported, handled, stored, and installed in keeping with applicable AWWA, ASTM etc. standards and manufacturer's instructions for the particular pipe material involved. For PVC piping system, the latest edition of the CHEMTROL PLASTIC PIPING HANDBOOK as published by Celanese Piping Systems, Inc., Louisville, Kentucky, shall be the project reference manual and instructions contained therein shall be followed.

Responsibility for Materials: During loading, transportation, unloading and storage, every precaution shall be taken to prevent injury to pipe, fittings and accessories and to keep them from dirt and foreign matter at all times. Particular care shall be taken to prevent damage to pipe and fitting linings and coatings. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate specifications.

Provide caps or plugs for open ends of pipe lines and equipment during installation to keep dirt and other foreign matter out of pipe and equipment.

Expansion: All piping mains, branches, and runouts shall be so installed as to allow for free expansion and contraction without developing leaks or undue stressing of pipe. Stresses shall be within allowable limits of ASA Code B31.1 for pressure piping.

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EXTERIOR:

General Pipe Laying: All pipe, special castings, valves, fittings, and the bells and/or spigots of same shall be thoroughly cleaned of all earth or other foreign matter before being fitted together. The spigot end shall be adjusted in the bell of the pipe, special casting or valve to allow for uniform gasket space, and the pipe shall be completely forced home and held there.

Prior to being lowered into the trench, each joint of pipe shall be carefully given a final inspection to see that each is clean, sound, and free of defects. Damaged sections shall be repaired to the satisfaction of the Engineer or removed from the Site.

Pipe shall be laid accurately to the line and grade as designated on the job plans. Bell holes shall be excavated for each joint to assure bedding supports the barrel of the pipe and to facilitate making a perfect joint.

Pipe shall be laid in perfect alignment between turns. No abrupt changes, either in grade or alignment, will be acceptable. At such locations where alignment changes are indicated on the plans, fittings and adjacent pipe shall be self restrained by harnesses or special fittings or external blocking. Do not bend or deflect pipe more than recommended by manufacturer.

Cross above or below existing pipe a minimum of 12" unless otherwise directed by the Engineer.

During construction of the line work the lines shall be kept free from debris. Trenches shall be kept free from water; and when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substances will enter the pipe or fittings. At the end of each day's work, the pipe shall be inspected to insure that dirt, water, and other materials have not entered the pipe.

PIPING JOINTS AND CONNECTIONS:

Mechanical Joints: Make up with Style A plain rubber molded gaskets, unless otherwise specified. Preparatory to making pipe joints, all surfaces of the portion of the pipe to be jointed or of the factory-made jointing materials shall be clean and dry. Gaskets, whether for the mechanical joint type or push joint type, shall be clean, flexible, and, where lubrication is required, be lubricated with a lubricant recommended by the manufacturer. Provide special joints capable of up to 5 degrees deflection per joint where shown on the drawings. Do not deflect or bend pipe more than recommended by manufacturer.

CLEANING:

Piping systems shall be thoroughly cleaned as follows:

Flush all pipe lines with clean water and perform visual inspection where possible to achieve a clean piping system clear of all debris, rust and dirt.

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THRUST RESTRAINT:

All plugs, caps, tees and bends deflecting 11-1/4 degrees or more shall be provided with reaction blocking of 2,500 psi concrete or suitable metal harness to prevent movement. Blocking shall be placed between solid earth and the fitting to be anchored. The blocking shall be placed such that pipe and fitting joints are accessible for repair and/or future connections. Where space limitations will not permit installation of concrete blocking where necessary to insure accessibility, where shown on the drawings, or if the Contractor so elects, pipe and fittings may be self restrained in addition to or in lieu of concrete blocking. Pipe shall be designed to carry additional stresses of thrust restraint. Details pertinent to such self-restraining harness, tie rods, special pipe, etc., including design criteria and computations, must be submitted to the Engineer for evaluation prior to incorporating such devices into the work. Systems based on metal to metal friction, such as retainer glands, will not be allowed for pressures above 100 psi.

Reaction Backing: The area of bearing of the concrete backing on the earth in each instance shall be at least equal to that shown in the table below. Minimum bearing area against undisturbed sand trench wall in square feet. Details of placement are shown in the drawing.

Areas shown are for 150 psi test pressure. If test pressure is other than 150 psi, adjust area of reaction backing in direct proportion.

<u>Pipe Size</u>	<u>Tees Plugs</u>	<u>Hydrant 90 Degree Els</u>	<u>Wyes 45 Degree Els</u>	<u>Wyes 22-1/2 Degree Els</u>	<u>Wyes 11-1/4 Degree Els</u>
4"	1	2	1	1	1
6"	3	3	2	1	1
8"	4	6	3	2	1
10"	7	9	5	3	2
12"	9	11	6	3	2
14"	11	15	8	5	3
16"	13	20	10	6	3

Areas based on sand; for other soil conditions revise areas as indicated:

- Cemented Sand or Hardpan - multiply above by 0.5
- Gravel - multiply above by 0.7
- Hard Dry Clay - multiply above by 0.7
- Soft Clay - multiply above by 2.0

Muck: Secure all fittings with approved harness or tie rod clamps, with concrete reaction backing the same as listed for sand conditions.

TESTING PIPING SYSTEMS:

See Section 330500

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DISINFECTION OF PIPING SYSTEMS:

See Section 330500

END OF SECTION 332110

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SECTION 332120 – WATER VALVES

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

DESCRIPTION OF WORK:

The extent of work covering valves and gates includes furnishing, installing, and making operational all valves and gates as indicated on the drawings and specified herein.

Related Work Specified Elsewhere:

Common Work Results for Utilities: Section 330500

Water Pipe and Pipe Fittings: Section 332110

Water Pipe Accessories: Section 332130

QUALITY ASSURANCE:

Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.

AWWA: All applicable standards

SUBMITTALS:

Shop Drawings: Submit shop drawings for all valves, valve boxes, tapping sleeves, and special items.

PART 2 - PRODUCTS

2" Ball Valve: Ball valves for two-inch services shall be bronze body with tee head. The turn required to travel from fully closed to fully open position shall be 90 degrees. Ball valves shall incorporate a check allowing a maximum turn of 90°. Ball valves shall be Hayes 4300, Ford B11-777, A Y McDonald 6101, Mueller B 20283, or approved equal.

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Gate Valves (3" and Larger): Gate valves shall conform to the requirements of the latest revision of AWWA Specification C-509/C-515 for resilient seated gate valves. The valve body shall be ASTM A-126 Class B cast iron or ductile iron and shall conform to ASTM A395 or ASTM A536. In addition, ductile iron shall contain no more than 0.08 percent phosphorous. All interior valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating. The valves shall open counterclockwise and have non-rising stem operation with 2-inch square operating nuts. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two. The stem shall be of corrosion resistant material and have "O" ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall have flange connections conforming to ANSI B16.1 Class 125 or mechanical joints conforming to AWWA C-111.

Valves shall be manufactured by Clow, American Flow Control, or Mueller.

Tapping Valves: Tapping valves shall conform to the requirements of the latest revision of AWWA Specification C-509 for resilient seated gate valves. The valve body shall be ASTM A-126 Class B cast iron. All internal valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating. The valves shall open counterclockwise and have non-rising stem operation with a two inch square operating nut. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two. The stem shall be of corrosion resistant material and have O-ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall have a flange connection conforming to ANSI B16.1 Class 125 and a mechanical joint conforming to AWWA C-111. Valves shall be manufactured by Mueller, Clow or American Flow Control. Tapping valves shall be installed and pressure tested prior to tapping the water line.

Valve Boxes (valves 2" through 10"): Valve boxes shall be of cast iron suitable for H-20 loading. The manufacturer's name and part number shall be cast into each component of the box. The box shall be of the telescoping (slip) type consisting of a base section, center extensions as necessary, and a top section with a cover marked "WATER". Sections shall be selected such that a minimum of four inches (4") of future adjustment (upward and downward) will be possible without section removal or replacement and without the use of adapters. Valve boxes shall be installed in accordance with the Standard Details.

Indicator Post: Cast iron indicator posts shall be provided in the locations shown on the drawings. Posts shall have two large window openings that are fitted with heavy clear plexiglass. Aluminum target plates, with the words OPEN and CLOSED cast in large, easy-to-read, raised letters shall be located behind each window in such a position that the appropriate word appears as the valve is operated. Stem, indicators, and all working parts shall be fully protected from moisture and weather damage by complete enclosure. The indicator posts shall be Clow F-5760, Americal Flow Control IP-71, Kennedy Valve Model 2945, or equal.

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BACKFLOW PREVENTION ASSEMBLIES

Control assemblies such as reduced pressure principle assemblies and reduced pressure principle detector assemblies shall be limited to those approved by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California.

Double Check Valve Assembly (DCA): The double check valve backflow preventer assembly shall be ASSE® Listed 1048, and supplied with full port gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536 Grade 4), the seat ring and check valve shall be Noryl™ (NSF listed), the stem shall be stainless steel (ASTM A 276) and the seat disc elastomers shall be EPDM. The first and second check valves shall be accessible for maintenance without removing the device from the line. The double check backflow prevention assembly shall be a FEBCO Model 805, Watts Series 007, Wilkins Model 950XL or equal.

Reduced Pressure Principle Backflow Preventer (RP) and Reduced Pressure Detector Assembly (RPDA): The reduced pressure principle backflow preventer shall be a complete assembly consisting of two independently acting springloaded toggle lever check valves together with an automatically operating pressure differential relief valve located between the two check valves. The first check valve shall reduce the supply pressure a predetermined amount so that during normal flow and the cessation of normal flow, the pressure between the checks is less than the supply pressure. In the case of leakage of either check valve, the differential relief valve shall discharge to atmosphere to maintain the pressure between the checks, less than the supply pressure. The unit shall include tightly closing shutoff valves located at each end of the device, and shall be fitted with four test cocks. Operation shall be completely automatic. All internal parts of the toggle lever check valves and pressure differential relief valve must be removable or replaceable without removal of the backflow preventer assembly from the line. The reduced pressure backflow preventer shall be similar in all respects to the FEBCO Model 825YD (OS&Y), Watts Series 909-OSY, Wilkins Model 375-OSY or equal.

The reduced pressure detector assembly shall be similar in all respects to the FEBCO Model 826YD (OS&Y), Watts Series 909-RPDA, Wilkins Model 375-RPDA or equal.

VALVE TAMPER SWITCH

Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position. Valve Supervisory Switch shall be by McWane, Inc.; Kennedy Valve Division, Potter Electric Signal Company or System Sensor.

PART 3 - EXECUTION

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GENERAL:

Install valves in the locations as shown on the drawings, plumb and centered and in absolutely true alignment. Support valves against settlement and misalignment with a suitable, lasting material as approved by the Engineer.

Clean valve interior of all foreign matter before installation. Tighten stuffing boxes and inspect valve in open and closed position to assure that all parts are working properly.

PAINTING:

Paint all exposed ferrous metal with two coats of asphalt varnish such as 667 Utility Black by Tnemec, unless otherwise directed by the Engineer.

BURIED SERVICE VALVES:

Install valve boxes for gate valves as indicated on the drawings. Adjust length of valve box to bring valve box cover to finished grade elevation. Center valve box over operating nut so that it fits around the stuffing box and rests on compacted ground. Align valve box so that it is plumb. Place and compact material in layers around valve box so as to prevent misalignment or shifting of the valve box or cover.

Where pavement is existing or proposed, the valve box shall be adjusted to finished street grade. When valve boxes are located in grassed or non-paved areas, install a pre-cast concrete collar (6" thick with 12" radius to the outer edge) to final grade.

Valve boxes shall be installed so that a minimum of four inches (4") of upward and four inches (4") of downward (total of eight inches (8")) vertical adjustment is possible without disturbing the base or removal of any box sections unless directed otherwise by Engineer. Valve boxes for 2" ball valves shall be supported by two (2) bricks.

The Contractor shall adjust valve boxes to final grade at the time designated by the Engineer. No additional compensation will be made for valve box adjustment.

Valve Tamper Switches shall be installed on all post-indicator valves and Reduced Pressure Detector Assemblies.

END OF SECTION 332120

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SECTION 332130 – WATER PIPE ACCESSORIES

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

DESCRIPTION OF WORK:

The extent of work covering pipe accessories includes furnishing, installing, and making operational all accessories as indicated on the drawings and specified herein.

Related Work Specified Elsewhere:

Common Work Results for Utilities: Section 330500
Water Pipe and Pipe Fittings: Section 332110
Water Valves: Section 332120

QUALITY ASSURANCE:

Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.

AWWA: All applicable standards

Manufacturer's Capabilities: Supplier of accessory items shall be regularly engaged in the manufacture of products of types and sizes required, and which have been in satisfactory use for not less than one year in similar service.

SUBMITTALS:

Shop Drawings: Submit shop drawings or product data for all accessory items.

PART 2 - PRODUCTS

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GENERAL:

Provide factory-fabricated piping accessories as hereinafter specified for use in the service indicated. Provide products of the type and pressure-rating indicated for each service or, if not indicated, provide proper selection as determined by the piping system installer to comply with installation requirements. Provide sizes and connections matching pipe, tube, valve and equipment connections.

Fire Hydrants: Fire hydrants shall be in accordance with AWWA Standard C502, latest revision thereof, suitable for an operating pressure of not less than 150 pounds per square inch and shall have a traffic breakable feature (safety flange and stem coupling), dry top, sealed lubrication reservoir and a main valve which is held closed with pressure. The hydrant body shall be of cast iron with "O" ring seals and bronze threads on the seat ring and drain ring, and shall have two (2) 2 1/2-inch nozzles and one (1) 5-inch nozzle with a factory fitted Storz connection and cap having National Standard threads. The hydrant main valve shall be a minimum of 5 1/4 inches in diameter. All continuously wetted hydrant parts and surfaces shall be of corrosion resistant materials or be epoxy coated with epoxy recognized by AWWA for potable water use. The epoxy coating shall be of a color other than black (unless the work "epoxy" is stenciled on the base) to permit distinction between standard and epoxy coatings to be made easily. Hydrants shall be American Flow Control B-84-B, Clow Medallion or Mueller A-423.

The inlet shoe for fire hydrant shall have a six inch (6") inside diameter and shall be cast or ductile iron with mechanical joint fittings in accordance with AWWA Standard C110.

Locked hydrant tees and fittings for fire hydrants shall meet the requirements of AWWA Standard C-111 (ANSI A21-11). Locked tees shall be as manufactured by American Cast Iron Pipe Company, Clow, U.S. Pipe, or approved equal.

Detectable Marking Tape (Tracing Tape): Tape shall be three (3) inches in width with a minimum thickness of 0.5 millimeters (minimum solid center foil thickness of 0.35 millimeters). Color of the tape shall be blue meeting the American Water Works Association color code. Tape shall read: "Caution- Buried Water Line Below". Tape shall be manufactured by Lineguard, Inc., Pro-Line Safety products Co., Empire Level Mfg. Corp., or approved equal.

Heated Insulated Enclosure: The enclosure manufacturer shall be a company specializing in the manufacture of such enclosures with at least five (5) years of successful field experience and being lab certified as meeting A.S.S.E 1060 requirements. The enclosure shall be manufactured of Mill finish aluminum, ASTM B209. Insulation shall be polyisocyanurate foam: spray applied, frothed in place or board stock laminated between two (2) layers of fiberglass mat.

The insulation shall have the following properties:

1. Dimensional stability - less than 2% linear change.
2. Comprehensive strength - 20 PSI.
3. Water absorption - less than 1% by volume.
4. Density - nominal 2.0 lbs. per cubic foot.

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5. Flame spread -25.
6. Service temperature - 100 degrees F to
7. 250 degrees F.
8. Insulation thickness shall be 1" for enclosures up to 2" IPS and 1.5" for 2.5 " IPS and above.

The roof, walls and access panels shall be constructed of the specified materials in the specified thicknesses. Multi-sectional enclosures shall fit together with overlapping "tongue and groove" joints and be secured internally with mechanical fasteners. The enclosure shall be securely attached to a concrete base with anchor brackets installed on the interior of the enclosure, through the flange base of the enclosure itself or through a stainless steel anchor hinge. Access panels shall be provided to allow easy access for operation, maintenance and testing of backflow prevention assembly without removal of assembly. Access panels shall be secured with padlock hasps and staples. Drain openings shall be designed to remain closed except when device is discharging water. Openings shall be designed to accommodate the maximum discharge of the device, and, shall protect against intrusion of wind, debris and animals, through the use of separate aluminum screen and wind flaps.

Heating Equipment shall be furnished and designed by the manufacturer of the enclosure to maintain and interior temperature of +40 degrees F with an exterior outside temperature of -30 degrees F and a wind velocity of 15 MPH. The factory assembled heating equipment shall be UL, ETL, or CSA certified. Electric power source for heat and accessories shall be G.F.I. protected, with 18" clearance from receptacle base to grade.

Mounting Hardware shall be furnished and shall be stainless steel. All assembly fasteners shall be stainless steel or aluminum. Anchor hardware shall be adjustable up to 1.5" vertically to accommodate uneven concrete slabs.

PART 3 - EXECUTION

GENERAL:

Install all piping accessories as shown on the drawings complying with all applicable portions of Section 02511 - Pipe and Pipe Fittings, manufacturers' instructions and as directed. Provide accessories of the sufficient size and ratings if not shown to complete and make ready for service all piping systems.

Touch-up paint all surfaces where the primer paint has been damaged or scarred during installation.

All ferrous-metal surfaces for underground installation shall be coated with a bitumastic paint.

END OF SECTION 332130

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SECTION 333100 - SANITARY SEWER SYSTEM

PART 1 - GENERAL

RELATED DOCUMENTS:

The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

DESCRIPTION OF WORK:

The extent of sanitary sewer system work is shown on the drawings.

Types of sanitary sewer facilities include the following:

- Collectors
- Service Laterals
- Manholes

Related Work Specified Elsewhere:

- Trenching, Backfilling and Compaction: Section 312200
- Concrete Paving: Section 321313

QUALITY ASSURANCE:

Codes and Standards: Comply with applicable standards contained herein and with the requirements of Greenville Utilities Commission.

Testing and Inspection: Contractor shall provide all necessary equipment and materials and shall perform the visual inspections, air testing and infiltration testing of the system in conformance with the requirements of this section.

SUBMITTALS:

Material Certificates:

Provide materials' certificates for pipe and manholes.

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Shop Drawings: Submit shop drawings and/or product data for all pipe and fittings, pipe gaskets, transitions, precast manholes, sewer brick, manhole covers and frames, and manhole steps.

Test Results: Provide three (3) copies of the Air Test Data Sheets signed by the Contractor and a Representative of Greenville Utilities Commission.

PART 2 - MATERIALS

SEWER MAIN:

ABS Composite Pipe: ABS pipe shall conform to the requirements of ASTM D2680, Standard Specification for Acrylonitrile - Butadiene-Styrene Composite pipe. Joints and fabricated fittings shall be chemically welded using a cement and primer recommended by the pipe manufacturer. The pipe shall be similar in all respects to Armco Truss Pipe as manufactured by Contech Construction Products, Inc. ABS pipe shall be supplied in 12.5 foot lengths.

Ductile Iron Pipe: All ductile iron pipe shall be manufactured in compliance with ANSI Standard A21.51 and shall be cement mortar lined in accordance with ANSI A 21.4. The exterior of the pipe shall have a one (1) mil bituminous coating in accordance with ANSI A21.51. The thickness class for ductile iron pipe shall be Class 50 with polyethylene encasement (polywrap) unless required otherwise by the Commission. Pipe shall be in nominal 18-20 foot laying lengths. The pipe joints for ductile iron pipe shall be "push-on" manufactured in accordance with ANSI 21.11. Where fittings are required, as in the installation of drop manholes, the fittings shall conform to the requirements of section 7.2.3 (water main fittings) of the GUC Design Manual.

Polyethylene Encasement: Polyethylene encasement shall be applied to all underground ductile iron pipe installations. Materials and installation procedures shall be in accordance with ANSI/AWNA C105/A21.5-88.

PVC Composite Pipe: PVC Composite Pipe shall conform to the requirements of ASTM D 2680, Standard Specification for Poly (Vinyl Chloride). Joints and fabricated fittings shall be elastomeric (gasket) joints and shall be assembled in accordance with the manufacturer's recommendations. Minimum cell class shall be 12454B. The pipe shall be similar in all respects to Armco Truss Pipe as manufactured by Contech Construction Products, Inc. PVC composite pipe shall be supplied in 12.5 foot lengths.

"Polyvinyl Chloride (PVC) Pipe" (8" - 15"): PVC pipe shall conform to the requirements of ASTM D3034 (SDR 35). Joints and fabricated fittings shall be elastomeric (gasket) joints and shall be assembled in accordance with the pipe manufacturer's recommendations and Specification D3212. Gaskets shall meet the requirements of ASTM F477. Minimum cell class shall be 12454B. PVC pipe shall be supplied in 13.0 foot lengths.

SERVICES:

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Sewer Service Pipe: Sewer service pipe shall be Schedule 40 PVC- Drain, Waste and Vent (DWV) pipe in accordance with ASTM D2665 and ASTM D1785. Cleanouts shall be constructed of pipe and fittings which also meet the ASTM requirements for Schedule 40 PVC-DWV pipe. Cleanout caps shall be Charlotte 110 or Jones BP134CSK flush cap. Cleanouts in traffic or paved areas shall be installed with a sewer cleanout box set to finished grade as shown in the standard details.

Service Fittings: Service saddles for use with ABS composite sewers shall be ABS saddle wyes as manufactured by Contech Construction Products, Inc. or approved equal. Wyes shall be chemically welded using the manufacturer's recommended primer, cement, and stainless steel bands.

Service fittings for use on PVC Composite Pipe shall be PVC standard gasketed wyes manufactured or approved by the pipe manufacturer and shall conform to the requirements of ASTM D2680.

Service fittings for use on PVC (SDR 35) pipe shall be standard gasketed wyes manufactured or approved by the pipe manufacturer and shall conform to the requirements of ASTM D3034.

Service from ductile iron pipe less than 18" in diameter shall be provided by means of ductile iron wyes meeting the requirements for water main fittings as given in Section 7.2-3 of the GUC Design Manual.

Transition Coupling: Pipe material changes between manholes may be permitted provided there is not a substantial difference in inside diameters, a smooth uniform flow line is maintained, and a watertight rubber sleeve or mechanical coupler conforming to ASTM C-425 is used to make the transition. All metal hardware shall be stainless steel. Transition sleeves shall be manufactured by Fernco or Indiana Seal.

MANHOLES:

Manholes: Manholes with a depth of 6' or less shall be precast and have concentric cones and monolithic bottom sections, manholes greater than 6' shall be precast and have eccentric cones and monolithic bottom sections unless otherwise approved by the commission in writing. Manholes shall conform to ASTM C-478. Joints shall be watertight and conform to the ASTM C478 standard for section joints designed for cold applied sealing compound. The sealing compound shall be CPS-210 as manufactured by Concrete Products Supply Company or approved equal.

Flat top manholes for gravity sewers shall be used only when approved in writing on a case by case basis by the Commission. Manholes of depth less than four feet (4') as measured from the top of the ring and cover to the lowest pipe invert shall require special design considerations. Shop Drawings shall be submitted to the Commission for such manholes.

The minimum inside diameter of manholes shall be 4.0 feet. Larger manholes shall be required for gravity sewers twenty inches (20") in diameter and larger. See the Standard Details.

Manholes more than twelve feet (12') in depth, as measured from the top of the ring and cover to the lowest invert, or as measured from surrounding finished ground elevation at the manhole

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location to the lowest manhole invert, whichever is greater, shall have an integral precast extended base as shown in the Standard Details.

Points of exit and entry for all pipe including services shall be provided with flexible manhole sleeves and all stainless steel take up clamps in accordance with ASTM C-923. Points of entry for mains or services which are added after fabrication of the manhole shall be provided by coring and installation of a flexible sleeve. All pipes shall extend through the manhole walls a minimum of 2 inches. Manholes exceeding twenty-three feet in depth shall require a certification from the manufacturer that the flexible sleeves provided are capable of withstanding a hydrostatic pressure equal to the depth of the manhole installed.

Manholes with preformed invert channels and benches may be utilized. Preformed invert channels must conform with Section 4.2.6.5 of the Greenville Utilities Commission (GUC) Design Manual. Points of pipe exit and entry shall conform with Section 8.4.5 of the GUC Design Manual. Manholes with inverts that are field constructed shall be done in accordance with the Standard Details.

The elevation difference between the "invert in" and "invert out" of manholes shall be either $< 0.5'$ or $> 2.5'$. Manholes having pipes entering at elevations $> 2.5'$ above the outlet shall be provided with an outside drop inlet according to the detail shown on the plans, if applicable.

Manhole rings and covers shall be manufactured in the USA of Class 30, gray cast iron conforming to the requirements of ASTM-A48 (latest revision thereof). The manufacturer's name and part number shall be cast into each component and the words "Sanitary Sewer" shall be cast into the cover. Pick holes shall be of the non-penetrating type. Bearing surfaces of both ring and cover shall be machined to insure proper fit and to prevent rattling.

APPROVED MANHOLE RING AND COVERS

	Model No.	Manufacturer
Standard	V-1384	East Jordan Iron Works/Vulcan Foundry
	USF 669 Frame & KL Cover	US Foundry
Low Profile	V-1384-3	East Jordan Iron Works/Vulcan Foundry
	USF 664 Frame & KL Cover	US Foundry
Watertight	202701	East Jordan Iron Works/Vulcan Foundry
	USF 710 Frame & LJ-SSG Cover	US Foundry
Locking	202704	East Jordan Iron Works/Vulcan Foundry
	USF 710 Frame & LJ-SSG Cover w/ Camlocks	US Foundry

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Watertight units, when required to be lockable, covers shall contain a locking device comprised of a stainless steel pentagon head bolt locking device which functions in the manner of a quarter turn fastener, as a part of the cover. All castings shall meet industry standards in regard to appearance and tolerances for dimensions and weight. Castings do not have to be painted. Manhole tops shall be designed and constructed for an H-20 traffic loading.

Manhole steps shall be constructed of 1/2" Grade 60 steel bars with a plastic coating and shall meet Federal Specifications RR- F-621C. Maximum vertical step spacing shall be sixteen inches (16") on center and shall be centered over the outlet pipe of the manhole.

- 2.1 REINFORCED CONCRETE. Reinforced concrete used in construction of piers, manholes and other structures shall conform to the applicable sections of the N.C. Department of Transportation Standard Specifications, revised January 1, 1990. Concrete used in the structures shall be Class A, 3,000 pound test in accordance with Section 900. Reinforcing steel shall conform to ASTM A-615, Grade 60 unless otherwise specified and shall conform to N.C. Department of Transportation Standard Specifications Section 425.
- 2.2 STONE BEDDING. Stone used for bedding of sewer mains, services, manholes and concrete piers shall be granite crusher run stone (NCDOT Size No. 57) as per Section 905 of N.C. Department of Transportation Standard Specifications as revised January 1, 1990.
- 2.3 TRANSITION COUPLINGS. The preferred transition connection between different sewer line materials shall be a standard manhole installation.

Pipe material changes between manholes may be permitted provided that there is not a substantial difference in inside diameters, a smooth uniform flow line is maintained, and a watertight rubber sleeve, mechanical coupler conforming to ASTM C-425 is used to make the transition. All metal hardware shall be stainless steel. Transition sleeves shall be manufactured by Fernco or Indiana Seal.

- 2.4 CLEAN-OUTS: shall be constructed of pipe and fittings which also meet the ASTM requirement for Schedule 40 PVC-DWV pipe. Cleanout caps shall be Charlotte 110 or Jones BP134CSK flush cap except cleanouts in paved locations shall be constructed of cast iron and have a brass plug. Cleanouts located in traffic or paved areas shall be installed with a sewer cleanout box set to finished grade as shown in the Standard Details.
- 2.5 STEEL ENCASEMENT PIPE: Steel encasement pipe shall be spiral welded or smooth wall seamless, consisting of grade "B" steel with a minimum yield strength of 35,000 psi and manufactured in accordance with ASTM A139 and A283. The pipe thickness shall be in accordance with the requirements of the right-of-way owner, but in no case less than that shown in the following table. The ends shall be beveled and prepared for field welding at the circumferential joints.

MINIMUM WALL THICKNESS FOR STEEL ENCASEMENT PIPE

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H20 for Highways		E80 for Railroads	
<u>NOMINAL DIAMETER</u>	<u>MINIMUM THICKNESS</u>	<u>NOMINAL THICKNESS</u>	
In inches	In inches	Coated	Not Coated
4 – 12-3/4	0.188	0.188	0.188
14	0.219	0.188	0.250
16-18	0.250	0.250	0.312
20	0.281	0.281	0.344
22	0.312	0.281	0.344
24	0.344	0.312	0.375
26	0.375	0.344	0.406
28-30	0.406	0.406	0.469
32	0.438	0.438	0.500
34-36	0.469	0.469	0.531
38-42	0.500	0.562	0.625

The encasement pipe shall be uncoated inside and out unless required otherwise by the right-of-way owner or the Commission.

Encasement pipe and joints shall be of leak proof construction, capable of withstanding design loading. The inside diameter of the encasement pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and larger in diameter. It shall, in all cases, be great enough to allow the carrier pipe to be removed subsequently without disturbing the casing pipe or roadbed. Engineer is to verify clearance between carrier pipe encasement pipe.

2.6 FORCE MAIN PIPE AND APPURTENANCES

2.6.1 Sewer force main pipe shall be a minimum of Class 200 PVC pipe or Class 50 ductile iron pipe.

2.6.1.1 PVC shall be Class 200 SDR 21 conforming to ASTM D1784 and ASTM D2241 (latest revisions). Fittings for PVC force main shall be ductile iron meeting the requirements of ANSI A21.10 and shall be designed for a minimum working pressure of 150 psi plus 100 psi surge pressure. The interior of all fittings shall be cement-mortar lined in accordance with ANSI 21.4 and the exterior of the fittings shall be bituminous coated in accordance with ANSI 21.51.

2.6.1.2 Ductile iron force main fittings shall meet the requirements for ductile iron water main set forth in Section 2.2.

2.6.1.3 All force mains shall include installation of a tee and valve with 6" quick connect and cap outlet to allow for future temporary bypassing of the pump station. This arrangement shall be installed on the discharge side of the pump station concrete valve

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vault.

2.6.2 Force Main Valves

- 2.6.2.1 Plug valves for sewage service shall be non-lubricated eccentric type plug valves, with cast iron body, resilient faced plug suitable for sewage service. Valves shall utilize a corrosion resistant seat material of ninety percent (90%) welded nickel machined to a smooth surface as per AWWA C-507-. All valve parts and surfaces shall be of a corrosion resistant material or have an epoxy coating sufficient to prevent corrosion. Bearings shall be sleeve-type, replaceable, stainless steel per AWWA C-507. Valve packing area shall comply with AWWA C-507 by using a multi V-ring configuration that is adjustable and field replaceable. Valves shall have flanged faces drilled in accordance with American Standard for 125 pounds and shall be suitable for an operating pressure of 175 psi. Plug valves eight inches (8") and larger shall be geared to provide suitable operation of the valve. Plug valves shall be as manufactured by Dezurik or approved equal.
- 2.6.2.2 Resilient seated gate valves shall comply with the requirements of AWWA. The valve body shall be ASTM A-126 Class B cast iron. All valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. The valves shall open counterclockwise and have non-rising stem operation with 2-inch square operating nuts. The stem shall be of corrosion resistant material and have "O" ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall be manufactured by American Flow Control, Clow, or Mueller.

2.6.3 Check Valves

Check valves, unless otherwise directed by the Commission, shall be lever and spring type, iron body, bronze mounted with pin, seat ring and disc of brass or bronze designed for working pressure of not less than 150 pounds per square inch. Valves shall have a suitable opening for cleaning without disconnection from the pipe. Valves shall be manufactured by American Flow Control, Mueller or Clow.

2.6.4 Air Relief Valves

- 2.6.4.1 Manual air relief valves shall be of materials identical to those of a one-inch (1") service with the exception that 1) a service saddle or clamp is required (no direct tapping is permitted), and 2) the tap shall be made at the top (crown) of the main; except that a) the control valve shall be installed in a standard manhole, and b) the service tubing shall be SDR 9 polyethylene in lieu of copper.
- 2.6.4.2 The design and selection of automatic air release valves shall be in accordance with the direction of the Commission and shall be handled on a case by case basis.

2.6.5 Joint Restraint

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2.6.5.1 Plugs, caps, tees, and bends on all force main pipe, installed both vertically and horizontally, shall be provided with joint restraint. Joint restraint will be provided by concrete thrust blocking.

2.15.5.2 Concrete Thrust Blocking: Shall have a 28-day compressive strength of 3000 psi.

Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed the base and thrust bearing sides of thrust blocks shall be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. The Contract Documents shall require thrust blocking at each horizontal and vertical change in direction of wastewater force mains. Trenches shall be excavated to provide uniform support of the blocking on undisturbed soil. The concrete shall be placed as shown in the Standard Details and shall not interfere with the removal of any bolts, fasteners, or fittings.

2.6.5.2 Restraint Devices

2.15.3.1 Restraint devices for use on ductile iron and C-900 PVC “push-on” joints shall be constructed of high strength ductile iron, ASTM A536, Grade 65-45-12 and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Block Buster Series 1390-C, Star Pipe Products Allgrip series 3600 and Pipe Restrainers Series 1200S, or approved equal.

2.15.3.2 Restraint devices for use on mechanical joint to C-900 PVC, shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1500, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc GripRing or approved equal.

2.15.3.3 Restraint devices for use on mechanical joint ductile iron, shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL

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listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1300-C, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc. GripRing or approved equal.

2.15.3.4 Bolted Couplings for PVC C-900 pipe and ductile iron pipe shall be constructed of a center sleeve and end rings of ductile iron in accordance with ASTM A536. Bolts and nuts shall be of high strength, low alloy steel per ASTM A242 and AWWA C-111. Center sleeve and end rings shall have a paint finish coat. Couplings shall be Ford Style FC1, Romac 501 Series, Smith Blair 441, or JCM 201.

PART 3 - EXECUTION

GENERAL:

Adherence to Standards and Instructions: All pipe shall be transported, handled, stored, and installed in keeping with applicable AWWA/ASTM standards and manufacturer's instructions for the particular pipe material involved.

Responsibility for Materials: During loading, transportation, unloading and storage, every precaution shall be taken to prevent damage to pipe, fittings, and accessories and to keep them free from dirt and foreign matter at all times. Particular care shall be taken to prevent damage to pipe and fitting linings and coatings. Pipe shall be protected during handling against impact shocks or free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate specifications. ABS or PVC pipe shall be protected from ultra-violet rays and from warping in accordance with manufacturer's recommendations.

INSTALLATION:

Pipe Laying: Each joint of pipe shall be carefully examined before being laid. Defective pipe shall be clearly marked and placed aside. Defective pipe shall not be installed.

Provide proper facilities for lowering pipe into trenches.

Ensure that the pipe bedding is set at true line and grade and is in conformance with the specifications.

Pipe shall be laid true to line and grade as designated on the plans with ends abutting. Each joint shall be tested for exact position by use of grade rod and plummet or laser. Carefully center the pipe so that when laid, they will form a sewer with a uniform invert. Ensure that when joining pipes of different wall thickness the inverts of the pipe joints form a smooth line.

Pipe having its grade or joint disturbed after laying shall be taken up, cleaned and re-laid.

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Pipe installed by use of laser shall be checked for proper grade with engineering level and grade rod at each manhole prior to continuing pipe laying operations. Additional checks every 50 feet may be required by the Engineer.

The Contractor shall not be allowed to skip any section of the pipe line and move further upgrade, except as special permission is granted by the Engineer, or when the Contractor has more than one complete pipe laying crew working on the project.

Truss pipe ends shall be sealed with solvent weld cement supplied by pipe manufacturer. Preparatory to making pipe joints, clean and dry all surfaces of the portion of the pipe to be jointed and all jointing materials. Provide ventilation when using solvent joints. Jointing materials shall be applied and installed in accordance with the manufacturers specifications and placed, fitted and adjusted in an acceptable manner.

Stone embedment shall be as indicated in Trenching, Backfilling, and Compaction Section 02220.

All pipe shall be laid so that markings are on top. All pipe in place shall be inspected before being covered or concealed.

Keep trenches water-free and as dry as practicable during bedding, laying and jointing. Place sufficient backfill along each side of pipe as soon as practicable to brace pipe on line and grade.

Place a plastic stopper or other suitable device in the end of the last joint of pipe at the conclusion of each day's work or at other times when pipe laying is not in progress.

Prevent the entry of water, dirt, tools or other foreign matter into the pipe line.

When tying into existing sanitary sewer system, install temporary mechanical plug in closest downstream manhole. In an effort to keep dirt and debris from entering existing sanitary sewer system, plug shall remain in place from beginning through completion of project.

After pipe laying, inspect the interior pipe surfaces with lights held at each manhole. A full circle of light must be visible when viewed from the opposite ends of the line. Immediately adjust any deviation from true line and grade and repair all visible leaks. Take extra care to compact stone under pipe just outside of manhole to prevent settling of the pipe. Do not correct problems with minimum slope and drop through manholes by adjusting only the first joint in the manhole. Reverse grade and bellies in pipe will have to be repaired and replaced.

Service Lateral Installation: Service lateral locations where shown on the plans are approximate for estimates and bidding. Verify that service will be properly located for each adjoining residence. The service shall be installed in accordance with the details shown on the plans.

Ensure that bedding and backfill is installed in conformance with requirements of Trenching, Backfilling and Compaction Section 02220.

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All joints shall be made in accordance with manufacturers recommendations. Ensure that the pipe is installed with at least a 1/8 inch per foot slope. Plug each service securely with a watertight plug.

Where services do not connect directly into a manhole, a service wye must be installed. All service pipe shall extend from the sewer main to the utility easement or right-of-way line unless directed otherwise by the ENGINEER.

All services shall have a clean-out installed at the easement or right-of-way line as shown on the plan details, or at a location directed by the Engineer. Clean-out shall consist of a wye fitting, bend, pipe, and cap or plug, all of the same material as the service pipe unless otherwise indicated.

Manholes: Construct manholes where shown on the plans and in accordance with the details.

Ensure that crushed aggregate bedding for manholes is properly installed and is true to line and grade. Set manhole base on bedding and verify conformance with line and grade as shown on the plans and that manhole is set plumb.

Pipe connection to existing manholes shall be made by machine coring such that the finished work will conform as nearly as practicable to the essential applicable requirements specified for new manholes, including all necessary concrete work, cutting and shaping.

Clean all joints and carefully inspect. Perform jointing in accordance with manufacturer's specifications. Insure a watertight seal at all joints.

Fill all interior and exterior joints, pinholes, lifting holes, and crevices with cement mortar to provide smooth surface. Fill all lifting holes and other holes through manhole with nonshrinking nonmetallic grout. Repair all air or water leaks in manholes from outside of manhole unless otherwise approved by the ENGINEER.

Accurately shape the inverts to a smooth semi-circle conforming to the inside contour of the adjacent sewer sections. All entering branches and changes in directions shall be formed by a circular curve in the invert of as large a radius as the size of manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels shall be formed directly in the concrete of the manhole base, or shall be built up with brick and mortar. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than 1 inch per foot nor more than 2 inches per foot.

Manhole steps shall be in vertical alignment and spaced uniformly approximately 16 inches apart.

Where drop manholes are indicated, or required they shall be constructed according to details shown on the plans.

Verify the elevation of ring and cover. Elevation of top should generally be as follows unless otherwise shown on plans:

Woodlands: 12" above grade.

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Lawns and other mowed areas: 2" above grade.

Open and Cultivated Fields: 6" above finished grade.

Paved Streets: Finished pavement grade.

Unpaved Streets: 4" below grade.

Where plans deviate from these dimensions, verify elevations with Engineer. Contractor shall adjust manholes to final grade at the time designated by the Engineer. No additional compensation will be made for manhole adjustment, except for existing manholes which require adjustment to finished street grade.

Secure manhole cover frame to manholes as outlined on the plans. Provide type of cover at each installation as indicated.

Separation From Water Mains: The sewer mains shall be laid at least 10 feet, horizontally, from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a water main if, the elevation of the top (crown) of the sewer is at least 18" below the bottom (invert) of the water main.

Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18" below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, then the sewer main shall be constructed of ferrous materials and with joints that are equivalent to water standards for a distance of ten (10) feet on each side of the crossing. The sewer main shall be pressure tested to assume watertightness prior to backfilling.

When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and sewer shall be constructed of ductile iron pipe for 10 feet in each direction and shall be pressure tested to assure watertightness.

Connections of new sewers to existing manholes shall be accomplished by machine coring and the installation of a flexible connector meeting the requirements of Section 8.4-5 of the GUC Design Manual.

Dewater as necessary to provide a safe, clean work area.

Pipe joints with manholes shall be made with flexible manhole sleeves and all stainless steel take up clamps in accordance with ASTM C-923.

TESTING AND INSPECTION OF SYSTEM:

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Testing and inspection shall promptly follow installation of wastewater pipe including services. Testing shall not be more than 1,000 feet behind wastewater pipe laying operation.

Furnish all pumps, gauges, instruments, test equipment and personnel required for inspection and testing operations.

All final testing and inspections shall be performed in the presence of the Resident Project Representative and a Representative of Greenville Utilities Commission.

Clean and pretest prior to notifying the Resident Project Representative and Greenville Utilities Commission's Representative and arranging for inspections and tests.

Inspect the system for conformance with line and grade shown on the plans and provide record drawing measurements per Section 01300 - Submittals. The maximum allowable drift between structures from proposed alignment is:

Horizontal alignment:	0.20 foot
Vertical Grade:	0.05 foot

Inspect the system for visible leaks (air or water). Repair all visible leaks. Correct all deviations from line and grade.

Materials removed to correct deficiencies revealed by tests and inspections shall not be reused. Pipe removed due to faulty grade shall be replaced with new pipe.

The following test sequence shall be included in the Contract Documents for all wastewater system extension unless otherwise permitted by the Commission.

1. Perform a visual inspection.
2. Correct defects revealed by visual inspection.
3. Perform leakage testing.
4. Make any necessary repairs.
5. Make the necessary retests.
6. Perform deflection testing (PVC SDR 35)

Visual Inspection For Gravity Sewers:

Gravity sewers shall be visually inspected from every manhole by use of mirrors, television cameras, or other devices. The lines shall appear circular in cross section with no noticeable deflection. Lines which do not meet specified tolerances or which have structural defects shall be replaced to meet the requirements of the Commission prior to leakage testing.

Deflection Testing for PVC (SDR 35) Gravity Sewers:

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If PVC (SDR 35) sewer pipe is utilized, deflection testing shall be required with a rigid device (mandrel) sized to pass 5% or less deflection (or deformation) of the pipe.

Deflection test 100% of the total footage of solid wall PVC pipe.

The mandrel device shall be cylindrical in shape and constructed with nine or ten evenly spaced arms or prongs. Mandrels with less than nine arms will not be approved for use. The dimensions of the mandrel shall be as listed in the table below: The diameter of the mandrel shall carry a tolerance of plus or minus 0.01 inch.

Nominal Diameter	Contact Length	Mandrel Diameter
8"	8"	7.28"
10"	10"	9.08"
12"	12"	10.79"
15"	12"	13.20"
18"	15"	16.13"
21"	16"	19.00"
24"	17"	21.36"
27"	18"	24.06"

Allowance for piping wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the "D" dimension but shall be counted in as a part of the 5% or lesser deflection allowance.

The mandrel shall be hand pulled by the Contractor through all sewer lines in the presence of the Commission Representative, unless directed otherwise by the Commission. Any sections of the sewer not passing the mandrel shall be uncovered and the contractor shall repair the sewer to the satisfaction of the Commission. These repaired sections shall be retested.

Deflection testing shall be conducted no earlier than 30 days after reaching final trench backfill grade, provided in the opinion of the Commission that sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth. If this cannot be achieved in the time after installation prior to the project completion date, then the mandrel size shall be increased to measure 1/3 less of a deflection allowance.

Contact length shall be measured between points of contact of the mandrel arm. This length shall not be less than that shown in the table above.

The mandrel may not be used until approved by the Commission. Proving rings provided by contractor shall be used to assist in this. Drawings of the mandrel with complete dimensions shall be furnished by the Contractor to the Commission for each diameter and specification of pipe.

The mandrel device shall be as manufactured by H and H Fabricating of Fairfield, Ohio or Wortco, Inc. of Franklin, Ohio; and shall be approved by the Commission."

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Leakage Testing For Gravity Sewers:

Unless otherwise permitted or required by the Commission, leakage testing for gravity sewers shall be by low pressure air test. Infiltration or exfiltration testing of the lines in lieu of air testing shall not be accepted without prior written approval of the Commission. All visible leaks shall be corrected regardless of the results of testing. All services, including those which discharge directly into manholes, shall be leakage tested.

Infiltration Test:

Infiltration testing shall be an acceptable test method only when the ground is fully saturated and the area is not subject to flooding. Immediately prior to performance of the line acceptance test, the groundwater level shall be determined by the same method used for the air test. The allowable infiltration rate shall be fifty (50) gallons per inch of pipe diameter, per mile of pipe, per twenty-four (24) hours.

Exfiltration Test:

The exfiltration test pressure shall be the greater of the following:

- (1) the maximum depth of the sewer test section as measured from the ground surface, plus the groundwater height above the lowest invert of the test section, or;
- (2) the 100 year flood elevation minus the lowest invert elevation of the test section, plus the ground water height above the lowest invert of the test section.

The exfiltration of the line shall not exceed fifty (50) gallons per inch of pipe diameter, per mile of pipe, per twenty-four (24) hours. The length of the test period shall be as required by the Commission, but in no case less than fifteen (15) minutes. Where a stream is not readily available as a source of water to use for testing, the Commission may agree to provide water. Proper procedures for requesting operation of valves and hydrants will be required.

Air Test: All air used for testing shall pass through a single, above ground control panel visible to the Commission's Representative during testing.

The Contract Documents shall require the groundwater elevation to be determined at 1000- foot intervals unless otherwise permitted or required by the Commission. Determination of groundwater elevation shall be made by vertically installing a six-inch diameter pipe beside the manhole such that the pipe extends into the stone bedding of the manhole. The test pressure shall be increased 0.43 psig per foot of groundwater head above the pipe invert.

The test pressure shall be 4.0 psig, plus the adjustment for groundwater. The air pressure shall be maintained for a minimum of two (2) minutes by throttling the air supply. The

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air supply shall then be disconnected and the pressure allowed to drop. At any convenient point at which internal air pressure is greater than 3.5 psig, (plus groundwater adjustment), timing shall commence with a stop watch or other timing device that is at least 99.8% accurate. The time required for the pressure to drop 1.0 psi shall be recorded.

The leakage rate shall be considered acceptable if the pressure does not drop over 1 psi in the time prescribed for the test as shown in the following table. Otherwise, the leakage rate shall be considered unacceptable.

The Contract Documents shall prohibit manhole entry during the test. The internal pressure on the system shall not exceed 9.0 psig.

Sewer service lengths shall be ignored for computing required test times for mains. In the event a test section, having a total surface area less than 625 square feet, fails to pass the air test when services have been ignored, the test time shall be recomputed to include all services using the following formula:

MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

1 Pipe Dia. (inch)	2 Minimum Time (min:sec)	3 Maximum Length For Minimum Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

If service lateral sewers are included in the test section, their lengths may be ignored for computing the required test times. The test will be slightly more severe. In the event a test section, having a total surface area less than 625 square feet, fails to pass the air test when lateral sewers have been ignored, the test time shall be recomputed to include all lateral sewers using the following formula:

$$T = 0.085 \frac{(D1)(D1) L1 + (D2)(D2) L2 + \dots (Dn)(Dn) Ln}{D1L1 + D2L2 + \dots DnLn} K$$

Q

Where T = Shortest allowable time, in seconds for the air pressure to drop 1.0 psig;

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$K = 0.000419 (D_1L_1 + D_2L_2 + \dots D_nL_n)$, but not less than 1.0"

$Q = 0.0015$ cu. ft./min./ sq. ft. of internal surface;

$D_1, D_2, \dots D_n$ = Nominal Diameters of the different size being tested

$L_1, L_2, \dots L_n$ = Respective Lengths of the different size pipes being tested.

If the recomputed test time is short enough to allow the section to pass, the section undergoing test shall have passed.

If the sections fail the air test, the Contractor shall determine at his own expense the source, or sources of leakage, and shall repair or replace all defective materials and workmanship.

No sealant shall be used in the newly installed sewers to correct the leaks without prior approval of the Engineer.

The extent and type of repair which may be allowed, shall be subject to the approval of the Engineer.

The repaired pipe installation shall be retested and required to meet the requirements of this test.

MANHOLE VACUUM TESTING:

Manhole shall be vacuum tested as indicated below unless otherwise allowed by the Engineer.

Watertight manholes shall be tested from the top of the manhole. Other manholes may be tested from the top of the cone section.

Manholes shall be tested after assembly and prior to backfilling.

Stubouts, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn.

Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations. Vacuum testing equipment shall be by P.A. Glazier, Inc. or equal.

A measured vacuum of 10 inches of mercury shall be established in the manhole. The time for the vacuum to drop to nine inches of mercury shall be recorded.

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Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches to nine inches of mercury. The maximum allowable leakage rate for a four foot diameter manhole shall be in accordance with the following:

<u>Manhole Depth</u>	<u>Minimum Elapsed Time for a Pressure Change of 1" Hg</u>
10 ft. or less	60 seconds
> 10 ft. but < 15 ft.	75 seconds
> 15 ft. but < 25 ft.	90 seconds

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes.

If the manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test or the manhole shall be tested in accordance with exfiltration test approved by the ENGINEER and rated accordingly. The extent and type of repairs that may be allowed shall be subject to the approval of the ENGINEER. Leaks shall be repaired on the outside of the manhole unless approved by the ENGINEER otherwise. All visible leaks shall be repaired regardless of the test results.

If a manhole joint mastic is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

Record all data on the Manhole Vacuum Testing Sheet provided.

REPAIRS:

The Contractor may offer a maintenance fee in lieu of certain repairs to the system if approved by the Commission and Engineer. The maintenance fee will have to be agreed to by the Owner and Engineer.

END OF SECTION 333100

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SECTION 33 41 00 - STORM UTILITY 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. This Section includes gravity-flow, non-pressure and storm drainage outside the building, with the following components:
 - 1. High density polyethylene pipe and fittings.
 - 2. Concrete pipe and fittings.
 - 3. Concrete.
 - 4. Catch basins.
 - 5. Curb inlets.
 - 6. Pipe outlets.
 - 7. Plastic clean outs.
 - 8. Manholes.
 - 9. Storm water detention structures.
 - 10. Trench drain & channel grate
- B. Related sections include the following:
 - 1. Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

1.3 DEFINITIONS

- A. Drainage Piping: System of storm water piping, fittings, and appurtenances for gravity flow of storm drainage.
- B. RCP: Reinforced concrete pipe.
- C. HDPE: High Density Polyethylene pipe for roof drains.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: 10-foot head of water (30 kPa). Pipe joints shall be at least silt tight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.

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- B. Shop Drawings: For the following:
 - 1. Piping, Manholes, Catch Basins, Storm Water Inlets, and Storm Water Detention Structures: Include plans, elevations, sections, details, frames, covers, and grates.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipefittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins, storm water inlets, and other drainage structures according to manufacturer's written rigging instructions.

1.7 PROJECT RECORD DOCUMENTS

- A. Contractor shall be responsible for preparing and submitting “As-Built” drawings by a registered North Carolina Surveyor for all storm water piping systems in the project area including work installed for this contract and existing storm water piping system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

- A. High Density Polyethylene Pipe and fittings (HDPE): According to the following:
 - High Density Polyethylene single wall, corrugated pipe meeting AASHTO M252; Type S. HDPE pipe will only be accepted where indicated on plans.
 - 1. Joints: Use bell and spigot joint meeting AASHTO M252, M294, or ASTM F2306. The joint shall be soil-tight and gasketed to meet ASTM F477.
 - 2. Fittings and accessories: Provide and install similar to joint angles shown on plan. Conform to AASHTO M252, M294, or ASTM F2306.
 - 3. Approved manufacturers:
 - a. ADS N-12 ST 1B.

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- b. Hancor.
- c. Lane.

2.3 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Pipe and Fittings: ASTM C 76 (ASTM C 76M) for pipes 12 to 144 inches, with bell-and-spigot ends and sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant.
 - 1. Class III, Wall B.

2.4 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

2.5 CATCH BASINS

- A. Heavy-Duty Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints. NCDOT H20 rated knockout waffle boxes with a minimum wall thickness of 5" thickness are approved for use within lawn areas. They shall not be used in any vehicular areas. If these boxes are used, the contractor shall have the structures pre-fabricated with the appropriate invert openings fabricated within the structures by the manufacturer prior to distribution from the manufacturer. Contractor has the option to score and core drill through structure to make a penetration for the pipe. Modification shall not compromise the structural stability of the storm structures. A maximum gap from pipe penetrations shall not be greater than 3". All penetrations around pipe shall be watertight. Installation of storm structures shall be approved by Architect prior to the material being delivered to the site. All storm structures shall adhere to all NCDOT Specifications. Waffle Boxes shall be approved to be used to a maximum 6'-0" depth from top of structure to slab bottom in lawn areas. All drainage structure in vehicular areas and any structure greater than 6'-0" depth shall comply with Paragraph 2.6 "Curb Inlets" below.

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1. Gaskets: Joint sealant shall meet requirements of AASHTO M198, type B.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
 3. Steps: Manufactured from deformed, ½-inch (13-mm) steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for structures less than 42 inches (1500 mm) deep.
- B. Masonry Drop Inlets (Contractor's option): Brick or block masonry structures shall be constructed in conformance with Section 830 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures. The brick or block walls shall be plumb and true and without defect. Mortar conforming to ASTM C270 shall be used.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Provide grate and frame conforming to jurisdictional requirements and as indicated on drawings.
1. Size: As indicated on drawings.

2.6 CURB INLETS

- A. Made with Heavy-Traffic Precast Concrete Curb Inlet: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading of depth, shape, and dimensions indicated, with provision for rubber gasketed joints. NCDOT H20 rated pre-fabricated full thickness boxes with a minimum wall thickness of 5" are approved for use in all vehicular areas. Knockout waffle boxes **are not** to be used. With the use of pre-fabricated boxes, contractor shall have the structures pre-fabricated with the appropriate invert openings fabricated within the structures by the manufacturer prior to distribution from the manufacturer. Contractor has the option to score and core drill through structure to make a penetration for the pipe. Modification shall not compromise the structural stability of the storm structures. A maximum gap from pipe to edge of cut out opening shall not be greater than 3". All openings around pipe shall be watertight. Installation of storm structures shall be approved by Architect prior to the material being delivered to the site. All storm structures shall adhere to all NCDOT Specifications.
1. Gaskets: Joint sealant shall meet requirements of AASHTO M198, type B.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
 3. Steps: Manufactured from deformed, ½-inch (13-mm) steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for structures less than 42 inches (1500 mm) deep.
- B. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility and NCDOT Specifications. Include heavy-duty frames and grates.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Provide grate and frame conforming to jurisdictional requirements and as indicated on drawings.

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- D. Storm water inlet grates shall be ADA compliant and bicycle-safe. "Bicycle-safe" means that bicyclists can ride "smoothly" and safely over the grates when traveling across the grates from any direction at attainable speeds. Grates where bicycle tires "drop-in" or "get stuck" are not considered safe.

2.7 PIPE OUTLETS

- A. Riprap Basins: Broken, irregular size and shape, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. As indicated on the drawings.
- 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.

2.8 PLASTIC CLEAN OUTS

- A. Basis of Design Product: Subject to compliance with requirements, provide materials indicated on drawings and comparable to one of the following:
 - 1. Canplas, LLC.
 - 2. IPS Corporation.
 - 3. NDS Inc.
 - 4. Zurn Light Commercial Products.
- B. Description: PVC body with PVC threaded plug. Include PVC sewer pipefitting and riser to cleanout.

2.9 MANHOLES

- A. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading of depth, shape, and dimensions indicated, with provision for rubber gasketed joints. NCDOT H20 rated pre-fabricated full thickness boxes with a minimum wall thickness of 5" are approved for use in all vehicular areas and lawn areas. Knockout waffle boxes **shall not** be used. With the use of pre-fabricated boxes contractor shall have the structures pre-fabricated with the appropriate invert openings fabricated within the structures by the manufacturer prior to distribution from the manufacturer. Invert locations shall not compromise the structural stability of the storm structures. A maximum gap at pipe penetrations shall not be greater than 1/2" (prior to sealing penetration). All pipe penetrations pipe shall be watertight. Installation of structures shall be approved by Architect prior to the material being delivered to site. All structures shall comply with NCDOT Specifications.
 - 1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 - 2. Joint Sealant: ASTM C 990 (ASTM C 990 M), bitumen or butyl rubber.
 - 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
 - 4. Steps: Manufactured from deformed, 1/2-inch (13-mm) steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or

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anchor into sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 42 inches (1500 mm) deep.

5. All manhole openings shall be installed so as to minimize surface water intrusion through the lid and positioned not to impede mowing. In grassed areas, the opening shall be at or above surrounding grade with a continuous gradual slope down from the opening to accommodate a 72" mowing deck. In paved areas, the opening shall be 1" above the surrounding grade with a continuous gradual slope down from the opening; maximum slope is 1/3" per foot.
6. Outside of manhole shall be coated with bituminous material, to prevent infiltration, prior to placing in ground. Section joints shall be coated once placed in final position prior to backfill.
7. Entire manhole structure shall be rated for continuous vehicle traffic loading per North Carolina Department of Transportation (NCDOT) standards.
8. Smooth channels shall be made at the manhole invert to convey storm water through manholes. These channels shall be made using grout that has been shaped and formed. The space between the grout channel and the manhole walls shall be filled with grout that is shaped to promote drainage back into the channel. The use of brick is allowed in constructing this grout shelf, but is not allowed elsewhere in manhole construction.

Diameter of Largest Pipe	Min. Required Manhole Diameter
18" & Smaller	4' Manhole
21" to 30"	5' Manhole
36" & Larger	6' Manhole

- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch (610-mm) ID by 7- to 9-inch (178- to 229-mm) riser with 4-inch (100-mm) minimum width flange, and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering 'STORM SEWER' cast into cover. Ring and cover shall comply with local standards and construction details.
- C. Butyl Seals For Manholes: Butyl resin concrete sealant shall meet or exceed all requirements of AASHTO M198 for Type B Flexible Plastic Gasket. Concrete sealant shall be provided as performed plastic gaskets in the size recommended by the sealant manufacturer for the entire perimeter of the manhole section. Sealant shall be properly sized to provide a minimum compression of 50% at maximum misalignment of joint and minimum 100% fill of annular area at proper alignment of joint. A parge coat of non-shrink grout shall also be provided over all internal joints and lift holes.

2.10 STORM WATER DETENTION STRUCTURES

- A. See drawings for materials.

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2.11 TRENCH DRAIN & CHANNEL GRATE

- A. Basis of Design Product: Subject to compliance with requirements, provide materials indicated:
 - 1. Manufacturer: NDS
 - a. Product: Spee-D Channel (Part No.: 400 [4' Section], 400-10 [10' Section])
 - b. Product: 2' Galvanized Steel Slotted Spee-D Channel Grate (Part No.: 254)
- B. Description: 4" depth trench drain. Provide NDS 2' Slotted Channel Grate, material shall be galvanized steel. Surface of drain cover to be flush with surrounding concrete and maintain ADA compliance. Variation from flush not to exceed plus or minus 1/8 inch (3 mm). Provide sections with bottom outlet where indicated on plans; Tie to 6" PVC outlet pipes with 6x4 PVC reducer. Provide 1/2" expansion joint with sealant where trench drain section meets adjacent concrete pads per drawings and manufacturer's recommendations. Locate where indicated on the drawings and install as detailed on the drawings, as elaborated in the specifications, and in conformance with manufacturer's recommendation. Single source trench drains and accessory materials.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm water piping. Location and arrangement of piping layout take design considerations into account. 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. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- E. Install gravity-flow, non-pressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope as indicated on drawings.
 - 2. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

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3. Install HDPE sewer piping according to ASTM D2321 and manufacturer's written instructions.
 - F. Access to the Work shall be along public rights of way or easements indicated on the Plans. Any encroachment upon private property shall not be permitted unless the Contractor secures specific authorization from the individual property owners concerned. All properties used for access, storage, construction, etc. shall be left in "as good" condition.
 - G. Contractor shall contact U-LO-CO at 1-800-632-4949 for location and flagging of utilities at least forty-eight (48) hours prior to start of excavations. See "Earthwork" specifications for additional utility locating requirements.
 - H. Contractor shall be fully responsible for damage and repair or replacement of any existing utility caused by construction operations.
 - I. All pipe, precast concrete manhole, drainage structures, grates; fittings shall be carefully handled to avoid damage and shall be inspected by the Architect or his representative prior to installation, preferably while suspended over the trench.
 - J. The Contractor shall install temporary watertight plugs in incomplete manholes or sewer lines prior to leaving the job site for any extended period of time. At a minimum, the pipes or manholes shall be plugged at the end of each workday.
 - K. Install pipe to slopes noted on drawings in the storm schedule. The maximum allowable slope variation is 1:1000 (0.1' per 100'). All storm piping shall be installed to have positive drainage (.50% min.).
 - L. Clean interior of pipe and structures of dirt and other material as work progresses.
 - M. Plug ends of pipe of uncompleted work at the end of the day for non-active lines.
 - N. All piping shall have three (3) feet minimum covers unless approved by Architect.
 - O. Storm Pipe Bedding
 1. RCP – Lay gravity storm sewer lines with Category I, II or III bedding as per Design Data 40 by American Concrete Pipe Association. Compaction per Design Date 40, Type 3 installation. Class IA, IB and II per ASTM D321 may also be used. Class IA and IB must be used in wet conditions. Bedding material shall be placed on trench bottom 4-inch minimum depth. Haunching material to be Category I, II, or III, compaction per Type 3 Installation. Initial backfill from the top of the haunching material up to 12 inches above pipe top consisting of select finely divided earth, hand placed and compacted before placing the remaining backfill.
 2. Bedding material shall be No. 57 or No. 5 stone.
- 3.3 PIPE JOINT CONSTRUCTION
- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

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- B. Join gravity-flow, non-pressure drainage piping according to the following:
 - 1. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 - 2. Join HDPE sewer piping according to ASTM F477 and manufacturer's written instructions.

3.4 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated on drawings.
- B. Set frames and grates to elevations indicated on drawings.

3.5 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated on drawings.
- B. Construct riprap of broken stone, as indicated on drawings.
- C. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated on drawings.
- D. Construct energy dissipaters at outlets, as indicated on drawings.

3.6 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

3.7 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill according to piping manufacturer's written instructions.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of detectable warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape over HDPE piping.
 - 2. Detectable Warning Tape: This tape shall provide pipeline identification, be fully detectable from above grade utility locators and be able to provide a depth reference point to top of pipe. It shall be 6" wide, installed directly on top of the pipeline and permanently secured to the pipeline at 10 ft. intervals. The tape shall consist of aluminum foil core or stainless steel tracer wires laminated between multiple layers of polyethylene tape with an overall thickness of 4 to 6 mils. Detectable core or tracer wire "circuit" shall be continuous from drainage structure to drainage structure for complete pipeline detection and location. Tape manufacturer's approved splice kits shall be used

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for long runs. Warning tape shall terminate just inside of drainage structure cover and be easily accessible for “clip-on” type utility location meters. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color-coded background that conforms to APWA color code standards.

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 (610 mm) of backfill is in place, and again at completion of Project.
 - 1. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - f. Cleaning: Sediment or debris is visible inside piping or structures.
 - 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 3. Flush inside of piping and structures with water to remove sediment or debris.
 - 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 authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
 - b. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
- 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.

3.10 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 33 41 00

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SECTION 33 46 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes subdrainage systems for the following:
 - 1. Athletic Field subdrains.

1.3 DEFINITIONS

- A. HDPE: High-density polyethylene plastic.
- B. PVC: Polyvinyl Chloride Plastic, Schedule #40.
- C. Subdrainage: Drainage system that collects and removes subsurface or seepage water.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Perforated-wall pipe and fittings.
 - 2. Solid-wall pipe and fittings.
 - 3. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

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2.2 PIPING MATERIALS

- A. Refer to the "Piping Applications" Article in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.3 PERFORATED-WALL HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

- A. High Density Polyethylene Pipe and fittings (HDPE): According to the following:
High Density Polyethylene single wall, corrugated pipe meeting AASHTO M252; Type S. HDPE pipe will only be accepted where indicated on plans.
 - 1. Joints: Use bell and spigot joint meeting AASHTO M252, M294, or ASTM F2306. The joint shall be soil-tight and gasketed to meet ASTM F477.
 - 2. Fittings and accessories: Provide and install similar to joint angles shown on plan. Conform to AASHTO M252, M294, or ASTM F2306.
 - 3. Approved manufacturers:
 - a. ADS N-12 ST 1B.
 - b. Hancor.
 - c. Lane.

2.4 SOLID-WALL PIPES AND FITTINGS

- A. High Density Polyethylene Pipe and fittings (HDPE): According to the following:
High Density Polyethylene single wall, corrugated pipe meeting AASHTO M252; Type S. HDPE pipe will only be accepted where indicated on plans.
 - 1. Joints: Use bell and spigot joint meeting AASHTO M252, M294, or ASTM F2306. The joint shall be soil-tight and gasketed to meet ASTM F477.
 - 2. Fittings and accessories: Provide and install similar to joint angles shown on plan. Conform to AASHTO M252, M294, or ASTM F2306.
 - 3. Approved manufacturers:
 - a. ADS N-12 ST 1B.
 - b. Hancor.
 - c. Lane.

2.5 SOIL MATERIALS

- A. Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Division 31 Section "Earth Moving."

2.6 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. (4480 to 13 440 L/min. per sq. m) when tested according to ASTM D 4491.

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1. Structure Type: woven, monofilament or multifilament.
2. Style(s): Flat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 PIPING APPLICATIONS

- A. Underground Subdrainage Piping:
 1. Perforated and solid wall PVC pipe and fittings.

3.4 PLAYGROUND DRAINAGE INSTALLATION

- A. 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.
- B. Inside playground area only, lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches (100 mm).
- D. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.
- E. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches (100 mm).
- F. Fill to Grade: Place satisfactory soil fill material over drainage course. Place material in loose-depth layers not exceeding 6 inches (150 mm). Thoroughly compact each layer. Fill to finish grade.

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3.5 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 - 1. Playground Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 18 inches, unless otherwise indicated.
 - 2. Lay perforated pipe with perforations down.
 - 3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install subdrainage piping according to ASTM D2321 and manufacturer's written instructions.

3.6 PIPE JOINT CONSTRUCTION

- A. Join HDPE pipe and fittings according to ASTM F477 and manufacturer's written instructions.
- B. Join perforated, PE pipe and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties"; or according to ASTM D 2321.
- C. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system or drain to daylight if indicated on drawings.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving."

3.9 FIELD QUALITY CONTROL

- A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

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3.10 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00