



Cleveland County Foothills Shooting Range Complex Improvements

Specifications Manual / March 2020 / CCY-18010



FORM 301 – ADVERTISEMENT FOR BIDS

Sealed proposals will be received by Cleveland County Board of Commissions in the Commissioners Chambers of the County Administration Building at 311 East Marion Street, Shelby, NC up to 2:00 p.m. on Tuesday, June 2, 2020 and immediately thereafter publicly opened and read for the furnishing of labor, material, and equipment for the Foothills Shooting Complex Improvements - Skeet and Trap Expansion, Cleveland County, NC.

Bids can also be hand delivered to *Kim Lester, Cleveland County Administration, 2nd Floor Finance Department, 311 East Marion Street, Shelby, NC 28150*. Or mailed to: *Cleveland County Administration, Attn: Kim Lester, PO Box 1210, Shelby, NC 28151*. All bids received by mail must be received before the time of bid opening. Email bids to Kim.Lester@clevelandcountync.gov.

Bids will be received for a single prime contract only. All proposals shall be lump sum.

Pre-Bid Meeting (not mandatory)

A pre-bid meeting will be held for all interested bidders at 11:00 a.m. on Wednesday, May 20, 2020 at the Friends of the Foothills Public Shooting Range, 1642 Pinedale Rd., Cherryville, NC 28021. The meeting will address project specific questions, issues, bidding procedures, and bid forms.

Complete plans, specifications and contract documents will be open for inspection in the offices of The John R. McAdams Company, Inc. and in the plan rooms listed below:

The John R. McAdams Company 2905 Meridian Parkway, Durham, NC 27713 (919) 361-5000 (919) 361-5922 fax	Associated General Contractors, Carolinas Branch (through partnership with iSqFt) http://www.isqft.com/ (800)-364-2059
Dodge Data & Analytics (formerly McGraw Hill Dodge Corporation) http://dodgeprojects.construction.com/ (877)-903-1909	CMD Group (formerly Reed Construction Data) http://www.cmdgroup.com/ 30 Technology Parkway South, Suite 100 Norcross, GA 30092 (800) 424-3996
NCIMED Plan & Resource Center 114 W. Parrish Street, 6th Floor Durham, NC 27701 (919) 956-8889	Hispanic Contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh Areas (through partnership with iSqFt) http://www.isqft.com/ (877) 227-1680

Complete plans and specifications for this project may be obtained from The John R. McAdams Company, Inc., 919-361-5000, beginning on **Monday, May 4, 2020** for a deposit of \$200.00 in cash or certified check. Checks shall be made payable to The John R. McAdams Company, Inc. The full plan deposit will be refunded to all bidders and non-bidders, provided the plans are returned bound, in order, and in good condition no later than 10 (ten) days following the bid date.

Cleveland County reserves the unqualified right to reject any and all proposals.

Signed: Brian Epley, County Manager, Cleveland County

FORM 302 - NOTICE TO BIDDERS

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NOTE: The bidder shall include with the bid proposal the form *Identification of Minority Business Participation* identifying the minority business participation it will use on the project and shall include either *Affidavit A* or *Affidavit B* as applicable. Forms and instructions are included within the Proposal

Form in the bid documents. Failure to complete these forms is grounds for rejection of the bid. (GS143-128.2c Effective 1/1/2002.)

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

General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for **Highway or Building Contractor with an unlimited license as required by the N.C. General Contractors Licensing Board under G.S. 87-1.**

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

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

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

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

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

No bids will be received after the specified time for receipt of bids.

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

Designer:
The John R. McAdams Company
2905 Meridian Parkway
Durham, NC 27713

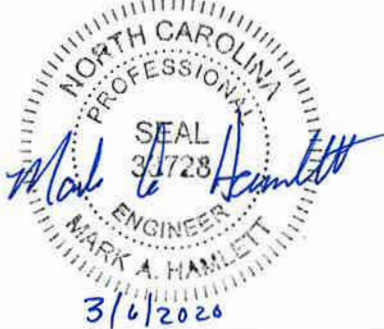
Owner:
Cleveland County
311 East Marion Street
Shelby, NC 28150

DESIGNERS CERTIFICATIONS

Professionals identified below are responsible for performing certain professional services defined in the Contract Documents and is the author of the following Specifications sections for this project.

<p><u>Civil Engineer</u></p> <p>The John R. McAdams Company NC License Number - C-0293 2905 Meridian Parkway Durham, North Carolina 27713</p> <p>Mark Hamlett 919-361-5000</p>	<p><u>Specifications</u></p> <p>011000 Summary 012100 Allowances 012200 Unit Prices 012300 Alternates 012500 Liquidated Damages 012600 Contract Modification Procedures 012900 Payment Procedures 013100 Project Management and Coordination 013200 Construction Progress Documentation 013233 Photographic Documentation 013300 Submittal Procedures 014000 Quality Requirements 014533 Tests and Inspections 015000 Temporary Facilities and Controls 015639 Temporary Tree and Plant Protection 017300 Execution 017419 Construction Waste Management and Disposal 017700 Closeout Procedures 017839 Project Record Documents 024113 Selective Site Removal 033000 Cast-in-Place Concrete 311000 Site Clearing 312000 Earth Moving 312317 Trenching 312319 Dewatering 312324 Flowable Fill 312500 Erosion and Sedimentation Control 329200 Turfs & Grasses 334100 Storm Utility Drainage Piping</p>
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Professional Seal



The seal is circular with a double-line border. The outer ring contains the text "NORTH CAROLINA" at the top and "ENGINEER" at the bottom. Inside the ring, the word "PROFESSIONAL" is at the top and "SEAL" is at the bottom. In the center, the license number "31728" is printed. A handwritten signature "Mark A. Hamlett" is written across the seal. Below the seal, the date "3/6/2020" is handwritten.

<p><u>Electrical Engineer</u> NV5 NC License Number – 041500 630 Davis Drive, Suite 203 Morrisville, North Carolina 27560 919-695-4200</p> <p>Stephen R. Vaughn</p>	<p><u>Specifications</u> 260100 Basic Electrical Requirements 260500 Basic Electrical Materials and Methods 260519 Low-Voltage Electrical Power Conductors and Cable 260526 Grounding and Bonding for Electrical Systems 260529 Hangers and Supports for Electrical Systems 260533 Raceways and Boxes for Electrical Systems 260543 Underground Ducts and Raceways for Electrical Systems 260553 Identification for Electrical Systems 262416 Panelboards 262726 Wiring Devices</p>
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Professional Seal



DATE: 03-05-2020

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Part 1 - General

1.1 Location of Site

- A. The site is located at 283 Fielding Road in Cherryville, North Carolina.

1.2 Contract

- A. A single bid will be received including all work under the General Contract. The General Contractor's Base Bid shall include all labor, materials, supplies, and equipment necessary to complete the work in its entirety including any General Construction, Plumbing, Mechanical, and Electrical.

1.3 Bidding Documents

- A. Bidding documents will be issued as outlined in the Advertisement. Drawings and specifications must be returned, under separate cover apart from Bid, within 10 days after award of Contract or issuance of a formal notice that bids have been rejected. Drawings and Specifications must be properly marked so that each set may be identified.

1.4 Bids

- A. All Contractors are notified that General Statutes of N.C., Chapter 87, Article 1, General Contract, and as amended, will be observed in receiving bids and awarding contracts. All federal, state and municipal laws governing each respective trade, will be complied with.
- B. Submit on loose bid forms enclosed with these specifications. Do not use bid form bound in specifications. Submit bid in a sealed envelope, so marked as to indicate its contents without being opened.
 - 1. Bidder shall fill in and sign his bid correctly. Bid forms that show any omissions, alterations of form, additions not called for, conditional bids, or any irregularities of any kind may be rejected.
 - 2. No bid may be withdrawn for forty-five (45) days after the bid opening.
 - 3. It is the Owners' intention to award a contract for completion of this project to the contractor submitting the lowest bid. However, the Owner reserves the right to reject any or all bids, or to accept any bid submitted, and to waive any informalities.
 - 4. Payments will be made by the Owner once a month in an amount equal to ninety five percent (95%) of the work completed and final payment within thirty (30) days after the completion and acceptance of the work.

1.5 Contractor's License

- A. Bidders must have proper license for Contractors as required by State Laws governing their trades. Bidder's license number shall be listed on his Bid Form and on the outside of sealed envelope in which Bid is submitted.

1.6 Site Investigation

- A. Each Bidder shall, before submitting his bid, examine the site to determine the extent of work involved and the conditions under which he must operate in performing this work. The submission of a bid will be construed as evidence that such an examination has been made, and no subsequent allowance will be made in this connection on behalf of the Contractor for any error or negligence on his part.

1.7 Interpretation of Drawings and Specifications

- A. Should a Bidder find discrepancies or ambiguities in, or omissions from drawings and specifications, or should he be in doubt as to their meaning, he shall at once notify the Architect who will issue an interpretation in the form of an addendum. This addendum will be forwarded to all Bidders.
 - 1. Bidders must act promptly and allow sufficient time for a reply to reach them before the date established for submission of bids. At a minimum bidders shall request clarification of specifications no later than ten (10) days prior to bid opening.
 - 2. No addendum will be issued later than seven (7) days prior to bid opening.
 - 3. Each Bidder must acknowledge receipt of all addenda in his Bid.
 - 4. No oral interpretations will be made to any Bidder as to the meaning or intent of the Contract Documents or be effective to modify and of the provisions of the documents.

1.8 Permits, Fees, and Taxes (see attached Permits/Approvals)

- A. Cost for electrical permits; fees for inspections as required by City, County, and/or State authorities; Social Security and other applicable local and Federal Government taxes and costs of all other permits, inspections and licenses for which the Contractor is liable shall be included in his estimate for the work.

1.9 Payment Bond

- A. An AIA Performance and Payment Bond will be required in an amount equal to one hundred percent (100%) of the Contract Price. Bond shall be delivered to the Architect within ten (10) days after notice of acceptance of proposal.

2.0 Bid Security

- A. Each Bid shall be accompanied by a cash deposit, a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a Bid Bond executed by a Surety Company licensed under the laws of N.C. to execute such bonds. The amount of such bid security shall be equal to 5% of the bid.
 - 1. Bid security shall be retained by Owner as liquidated damages in event of failure of successful bidder to execute Contract within ten (10) days after award or to give satisfactory surety as required by law (General Statutes of N.C., C.143, Art. 8, S.129).
 - 2. Bid Bond, if submitted as security, shall be conditioned that the Surety will upon demand forthwith make payment to the obligee upon said bond if the Bidder fails to execute the Contract in accordance with the Bid Bond, and upon failure to forthwith make payment, that the Surety shall pay to the obligee an amount equal to said Bond.

2.1 Liquidated Damages

- A. See Section O1021 - Liquidated Damages.

2.3 Minority Businesses

- A. Contractors shall take note that the Owner requires documentation of minority participation of a minimum of 10% of the contract price or a good faith effort to achieve such. Following is the "Cleveland County MWDBE Outreach Plan and Guidelines" and the documents that shall be used to document minority participation. "Identification of Minority Business Participation" and either Affidavit A or Affidavit B shall be submitted with your bid. After being notified as being the lowest responsible bidder, either Affidavit C or Affidavit D will be required within 72 hours after notification of being such bidder.

Designer:

The John R. McAdams Company
2905 Meridian Parkway
Durham, NC 27713
Phone: 919-361-5000

Owner:

Cleveland County
P.O. BOX 1210
Shelby, NC 28151

SUPPLEMENTARY GENERAL CONDITIONS

GENERAL CONDITIONS

The "General Conditions of the Contract for Construction", AJA Document A201, latest edition, Articles 1 through 15 inclusive, is part of this Contract.

SUPPLEMENTS

The following supplements modify the "General Conditions of the Contract for Construction", AJA Document A201. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1 - CONTRACT DOCUMENTS

1.1.1 Add the following:

The Contract Documents shall also include the **Performance Bond, Labor and Material Payment Bond**, and the Insurance Certificates.

1.2 Correlation and Intent of the Contract Documents

Add the following Subparagraph:

1.2.4 In the case of inconsistency between Drawings and Specifications or within either document which was not clarified by addendum, the Contractor shall provide and install the better quality of materials, equipment, or services and /or the greater quantity of work in accordance with the Designer's Interpretation.

ARTICLE 2 - OWNER:

2.2.5 Add the following:

Each Contractor will be furnished free of charge, copies of the Drawings and Specifications as noted below and will be furnished, at actual cost of reproduction, as many additional copies as he may require.

General Contractor 10 sets of prints

ARTICLE 3 - CONTRACTOR:

3.2.4 Omit last sentence.

3.4.1 Delete and substitute:

3.4.1 Unless specifically noted otherwise, the Contractor shall provide and pay for all labor, transportation, materials, equipment, tools, construction equipment and machinery, water, heat, lights, power, utilities, sanitary facilities, and other facilities and services necessary for the entire, correct and substantial completion of his work. The Contractor shall install, maintain, and remove all equipment of construction, other utensils or things; and shall be responsible for safe, correct and lawful construction, maintenance and use of same.

3.4.2 Delete and substitute:

3.4.2 After the contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1, Section "Summary of the Work"). By making a request for substitutions, the Contractor:

- .1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 certified that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and
- .4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

3.18.1 Delete and substitute:

3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work described in this Paragraph 3.18.

ARTICLE 5 - SUBCONTRACTORS:

5.2.1 Add the following:

5.2.1.1 Not later than ten (10) days after the commencement, the Contractor shall furnish in writing to the Owner through the Architect, the names of persons or entities proposed as manufacturers for each of the products identified in the General Requirements (Division 1 of Specifications) and, where applicable, the name of the installing Subcontractor.

ARTICLE 7 - CHANGES IN THE WORK:

7.3 Add the following Subparagraph:

7.3.11 The allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

- .1 For the Contractor, for Work performed by the Contractor's own forces, 10 percent of the cost.
- .2 For the Contractor, for Work performed by the Contractor's Subcontractor, 5 percent of the amount due the Subcontractor.
- .3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor or Sub-subcontractor's own forces, 10 percent of the cost.
- .4 For each Subcontractor, for Work performed by the Sub-contractor's Sub- subcontractors, 5 percent of the amount due the Sub-subcontractor.
- .5 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
- .6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over \$100.00 be approved without such itemization.

ARTICLE 8 - TIME:

Delete subparagraph 8.3.3 in its entirety and substitute the following:

8.3.3 In the event Contractor is delayed at any time in the process of the work, extension of time shall be the Contractor's sole remedy for any such delay (except Contractor's right to terminate this agreement pursuant to any applicable provisions of the Owner- Contractor Agreement), unless the same shall have been caused by acts constituting intentional interference by the Owner with Contractor's performance of the work and where, and to the extent that, such acts continue after the Contractor's notice to the Owner of such interference. Written notice of intentional interference by the Owner must be given within three (3) days of the occurrence or the claim is waived. The Owner's exercise of any of its rights under any applicable provisions of the Owner-Contractor Agreement relating to changes in the work, or requirement

of correction or re-execution of any of the work, shall not, under any circumstances be construed as intentional interference with the Contractor's performance of the work.

ARTICLE 9 - PAYMENT AND COMPLETION:

9.3.1 Add: "The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet."

9.3.1 Add the following clause:

9.3.1.3 Until Substantial Completion, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments.

9.8.5: Delete "Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof" and substitute:

"The payment shall be 95 percent of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims."

ARTICLE 11 - INSURANCE AND BONDS

11.1 Contractor's Liability Insurance: Add subparagraphs:

11.1.1.7 Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- a. Premises Operations (including X,C and U coverages as applicable).
- b. Independent Contractors' Protective.
- c. Products and Completed Operations.
- d. Personal Injury Liability with Employment Exclusion deleted.
- e. Contractual, including specified provision of Contractor's obligation under Paragraph 3.18.
- f. Owned, non-owned and hired motor vehicles.
- g. Broad Form Property Damage including Completed Operations.

11.1.1.8 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

11.1.2 Add the following clause:

The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Workers' Compensation
 - a. State: Statutory
 - b. Applicable Federal: Statutory
 - c. Employer's Liability: Not less than \$1,000,000 each accident.

Not less than \$500,000 disease policy limit. Not less than \$100,000 disease ea. employee
2. Comprehensive or Commercial General Liability (including Premises- Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage):
 - a. Bodily Injury: \$1,000,000 each occurrence; \$2,000,000 aggregate.
 - b. Property Damage: \$1,000,000 each occurrence;

\$2,000,000 aggregate.
 - c. Products and Completed Operations to be maintained for one (1) year after final payment.
 - d. Property Damage Liability Insurance shall provide X, C, and U coverage.
 - e. Broad Form Property Damage Coverage shall include Complete Operations.
3. Contractual Liability:
 - a. Bodily Injury: \$1,000,000 each occurrence; \$2,000,000 aggregate.
 - b. Property Damage: \$1,000,000 each occurrence;

\$2,000,000 aggregate.
4. Business Auto Liability (including owned, non-owned and hired vehicles):
 - a. Bodily Injury: \$1,000,000 each person; \$1,000,000 each occurrence.
 - b. Property Damage: \$500,000 each occurrence.
5. Excess Liability- Umbrella Form
 - a. Each occurrence \$1,000,000
 - b. Aggregate \$1,000,000

11.1.3 Add the following sentence:

"If this insurance is written on the Comprehensive General Liability policy form, the Certificates shall be AIA Document G705, Certificate of Insurance."

11.3.1 Modify the first sentence of Subparagraph U .3.1 as follows: "unless otherwise provided, the Owner" and substitute "the Contractor".

Add the following sentences:

"The form of policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto."

11.3.1.2 Delete Clause 11.3.1.2.

11.3.1.3 Delete Clause 11.3.1.3.

11.3.4 Delete Subparagraph 11.3.4.

11.3.6 Delete and substitute the following:

"11.3.6 Before an exposure to loss may occur, the Contractor shall file with the Owner two certified copies of the policy or policies providing this Property Insurance coverage, each containing those endorsements specifically related to the Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Owner."

11.3.7 Modify by substituting "Contractor" for "Owner" at the end of the first sentence.

11.3.8 Modify by substituting "Contractor" for "Owner" as fiduciary; except that at the first reference to "Owner" in the first sentence, the word "this" should be substituted for "Owner's".

11.3.9 Modify by substituting "Contractor" for "Owner" each time the latter word appears.

1.3.10 Modify by substituting "Contractor" for "Owner" each time the latter word appears.

11.4 Performance Bond and Payment Bond:

Delete Subparagraph 11.4.1 and substitute the following:

11.4. | The Contractor shall furnish bonds covering a faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

11.4.1.1 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto

in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.4.1.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK:

12.1.2 Delete first sentence and substitute:

12.1.2 If a portion of the Work has been covered which the Architect has not specifically requested to observe by owner or by contractor prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor.

ARTICLE 13 - MISCELLANEOUS PROVISIONS:

13.7 TIME LIMITS ON CLAIMS: Delete.

Add the following Paragraph 13.8 to Article 13:

13.8 Equal Opportunity

13.8.1 The contractor shall maintain policies of employment as follows:

13.8.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination.

13.8.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

At the end of Supplementary Conditions add the following:

ARTICLE 15 - CLAIMS AND DISPUTES:

15.1.5 Claims for Additional Time: Add the following subparagraphs:

15.1.5.3 It is the intent of the construction contract that the work be completed on time regardless of periodic delays which may be caused by adverse weather conditions. By entering into the contractual agreement, the contractor agrees to use additional work forces, extended work hours, work on Saturdays and Sundays, at night, and any other means available and necessary to complete the work on time. The contractor further agrees that the amount of time for construction is sufficient based on typical and normal weather conditions relative to the location of and construction time frame for the project.

15.1.5.4 In the event that the contractor believes unusual weather conditions, e.g. abnormal rainfall, extremely low temperatures, or other weather phenomena such as hurricanes, tornadoes, etc. have delayed the work, he may request an extension of time for these delays.

15.1.5.5 For the purpose of determining the extent of delay attributable to unusual weather conditions, such as abnormal rainfall or extremely low temperatures, a determination shall be made by comparing the actual weather for the monthly contract period of time involved with the average weather conditions of the preceding five year climate range, during the same monthly period of time.

15.1.5.6 It shall be the contractor's responsibility to submit supporting documentation from the National Oceanic and Atmospheric Administration National Weather Service for the locality where the work is performed. The contractor shall also submit with the documentation copies of daily weather logs indicating the effect of the unusual weather on the work in progress at the time.

15.1.5.7 Any claims for additional time shall be submitted by the contractor on a monthly basis along with the contractor's monthly pay request covering the same period of time in question. Substantiating documentation from the National Weather Service may be submitted up to 30 days after the original request for a time extension. Requests for time extensions based on weather delays not submitted with the concurrent pay request shall not be considered.

15.1.5.8 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

SAFETY AND HEALTH REGULATIONS:

Contractor shall comply with the latest revisions and interpretations of "Safety and Health Regulations in Construction" (US Department of Labor, Bureau of Labor Standards), and with other applicable laws, rules and regulations relating to safety and health.

Work on and for the Project shall conform to requirements of the "North Carolina State Building Codes"; to the latest revisions and interpretations of the "Occupational Safety and Health Standards" (US Department of Labor, Occupational Safety and Health Administration); and to all other applicable codes, laws, rules and regulations.

END OF GENERAL & SUPPLEMENTARY GENERAL CONDITIONS

**COUNTY OF CLEVELAND
NORTH CAROLINA**



**Minority-owned, Woman-owned, Disadvantaged-owned
Business Enterprises
(MWDBE)**

Outreach Plan and Guidelines

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OUTREACH PLAN AND GUIDELINES FOR RECRUITMENT AND SELECTION OF MWDBE FOR PARTICIPATION ON COUNTY OF CLEVELAND BUILDING CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for MWDBE participation in single-prime bidding, separate-prime bidding, Construction Manager-at-Risk, and alternative contracting methods on County of Cleveland building construction projects in the amount of \$100,000 or more. The Outreach Plan shall also be applicable to the selection process of architectural, engineering and Construction Manager-At-Risk services.

The County of Cleveland's current goal for MWDBE participation for public building construction is ten percent (10%). The overall goal will be reviewed annually or as soon as relevant data is available.

INTENT

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

DEFINITION

1. Minority – a person who is a citizen or lawful permanent resident of the United States and who is:
 - a. Black, that is, a person having origins in any of the black racial groups in Africa;
 - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central American, or the Caribbean Islands, regardless of race;
 - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, or the Pacific Islands;
 - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
 - e. Female
2. Minority Business – means a business
 - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and

- b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals.
- 3. Socially and economically disadvantaged individual – means the same as defined in 15 U.S.C. 637. “Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities”. “Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged”.
- 4. Public Entity – means State and all public subdivisions and local government units.
- 5. Owner – The County of Cleveland.
- 6. Designer – Any person, firm, partnership, or corporation, which has contracted with The County of Cleveland to perform architectural or engineering work.
- 7. Bidder – Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.
- 8. Contract – A mutually binding legal relationship, or any modification thereof, obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
- 9. Contractor – Any person, firm, partnership, corporation, association, or joint venture which has contracted with the County of Cleveland to perform construction work or repair.
- 10. Subcontractor – A firm under contract with the prime contractor or Construction Manager-at-Risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in the subcontract.

MWDBE and Small Business Participation Outreach Plan

- 1. Work with MWDBE and small business groups that support MWDBE and small business inclusion in the solicitation of bids. These groups include the Cleveland Community College Small Business Development Center and the Small Business Technology Center.

2. Place more emphasis on the importance of soliciting certified MWDBE firms and small businesses for subcontracting opportunities at pre-bid conferences and in the bid documents. Examine specifications to identify special subcontracting opportunities and strongly encourage prime contractors to solicit bids for subcontracts from MWDBE firms.
3. Provide detailed information to majority contractors concerning the Guidelines for Recruitment and Selection of Minority Business and Outreach Plan and provide information on G.S. 143-129 by holding meetings with the contractors.
4. Assess the effectiveness of the MWDBE Program, and identify opportunities to enhance it, by evaluating MWDBE participation and compliance and reviewing the “good faith efforts” provided in bid packages.
5. Identify subcontracting opportunities unique to each construction contract and project and concentrate heavily on targeting certified MWDBE firms and small businesses that have expressed an interest in County of Cleveland projects. Identify these opportunities and contact interested businesses no later than 10 days prior to the bid opening and provide a list of prime contractors that plan to participate in the project.
6. Build new business relationships through networking. Continue networking with other North Carolina cities and counties to determine how other Outreach Programs and MWDBE programs are working. Share “best practices” and ideas to improve the program.
7. Participate in education opportunities throughout the community as they become available and offer training sessions to share the County’s Outreach Plan with interested businesses and organizations.
8. Be visible through participation in trade shows and business organizations of interest to MWDBE firms, majority contractors and small businesses, and provide information to the general public about the MWDBE Program, and continue outreach efforts to the business community.
9. Enhance the County’s web page by including the Outreach Plan and Guidelines, listing good faith efforts, and creating links to MWDBE resources, and creating awareness of specific subcontracting opportunities.
10. Make available to minority-focused agencies, a list of subcontracting opportunities when they are identified no later than 10 days prior to the bid opening, and a list of prime bidders that subcontractors may wish to contact for subcontracting consideration.

11. Continue to maintain a database specifically for MWDBE firms and minority contractors to ensure those firms wishing to do business with the County of Cleveland have access to up to date information.
12. Advertise upcoming bid opportunities in minority-focused media.
13. Work with architects and engineers to make subcontracting opportunities more noticeable and more easily understood by potential contractors and subcontractors.

DESIGNER

Under the single-prime bidding, separate prime bidding, dual bidding, Construction Manager at-Risk, or alternative contracting method, the designer must do all of the following:

- a. Attend the scheduled prebid conference to explain MWDBE requirements to the prospective bidders.
- b. Assist the owner to identify and notify prospective MWDBE prime and subcontractors of potential contracting opportunities.
- c. Maintain documentation of any contacts, correspondence, or conversations with MWDBE firms made in an attempt to meet the goals.
- d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposal for identification of the MWDBE businesses that will be utilized with corresponding dollar value of the bid and affidavit listing Good Faith Efforts or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) – prior to recommendation of an award.
- e. During the construction phase of the project, review "MWDBE Documentation for Contract Payment" form with monthly pay applications to the owner and forward copies to the County of Cleveland.

PRIME CONTRACTOR(S) CONSTRUCTION MANAGER-AT RISK, AND ITS FIRST-TIER SUBCONTRACTORS

Under the single-prime bidding, the separate-prime bidding, dual bidding, Construction Manager-at-Risk and alternative contracting methods, contractor(s) must do all of the following:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification must include all of the following:
 - A description of the work for which the subbid is being solicited.
 - The date, time and location where sub bids are to be submitted.
 - The name of the individual within the company who will be available to answer questions about the project.
 - Where bid documents may be reviewed.

- Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.
- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
 - e. Identify on the bid the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f) or Intent to Perform Contract With Own Workforce affidavit.
 - f. Make documentation-showing evidence of implementation of Prime Contractor, Construction Manager-at-Risk and First Tier Subcontractor responsibilities available for review by The County of Cleveland upon request.
 - g. Provide one of the following upon being named the apparent low bidder: (1) an affidavit 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. This affidavit shall give rise to a presumption that the bidder has made the required good faith effort; or (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. The documentation must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations, and evidence of other specific actions demonstrating recruitment and selection of MWDBE for participation in the contract. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
 - h. Identify the name(s) of MWDBE business subcontractor(s) and corresponding dollar amount of work on the schedule of values.
 - i. Submit with each monthly pay requests(s) and final payment(s), "MWDBE Documentation for Contract Payment" for designer's review.
 - j. If at any time during the construction of a project, it becomes necessary to replace a MWDBE subcontractor, immediately advise the owner in writing of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.
 - k. Make a good faith effort to solicit sub bids from MWDBE businesses during the construction of a project if additional subcontracting would become available.

MWDBE RESPONSIBILITIES

The County of Cleveland does not certify minority, disadvantaged or woman-owned businesses. Any business, which desires to participate, as an MWDBE will be required to complete and submit for certification, documents required by the agencies listed below. Only those firms holding current certification through at least one of the following agencies will be considered eligible for inclusion in meeting the MWDBE participation percentage goals:

North Carolina Administration Department Historically Underutilized Business (HUB) certification.

North Carolina Department of Transportation Minority/Disadvantage/Woman-owned Business certification.

Small Business Administration 8(a) certification.

Other governmental agencies on a case-by-case basis.

A copy of these guidelines will be issued with each bid package for the County of Cleveland building construction projects. These guidelines shall apply to all contractors regardless of ownership.

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 County of Cleveland for the performance of the contract. Failure to comply with any of these statements, affidavits or intentions, or with the MWDBE business guidelines shall constitute a breach of contract. A finding by the County that any information submitted either prior to award of the contract or during the performance of the contract, is inaccurate, false or incomplete shall 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 County of Cleveland whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the County of Cleveland will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. At least five of the following ten good faith efforts must be made in order to meet the Good Faith Efforts requirement:

- Contact MWDBE 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 notify them of the nature and scope of the work to be performed.
- Make the construction plans, specifications and requirements available for review by prospective MWDBE businesses, or provide these documents to them at least 10 days before the bid or proposals are due.
- Breakdown or combine elements of work in economically feasible units to facilitate minority participation.
- Work with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and those included in the bid documents to provide assistance in recruitment of minority businesses.
- Attend any pre-bid meetings scheduled by the public owner.
- Provide assistance in getting required bonding or insurance or provide alternatives to bonding or insurance for subcontractors.

- Negotiate in good faith with interested MWDBE businesses and do not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a MWDBE business based on lack of qualification should have the reasons documented in writing.
- Provide assistance to an otherwise qualified MWDBE 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. Assist MWDBE businesses in obtaining the same unit pricing with the bidder's suppliers in order to help MWDBE businesses in establishing credit.
- Negotiate joint venture and partnership arrangements with MWDBE businesses in order to increase opportunities for MWDBE business participation on a public building construction or repair project when possible.
- Provide quick pay agreements and policies to enable MWDBE contractors and suppliers to meet cash-flow demands.

MWDBE/DBE PARTICIPATION GUIDELINES

The following guidelines regarding MWBE/DBE participation were adopted by the County of Cleveland and will be followed on all Construction and Repair projects. All such projects must be routed through the Purchasing Office to ensure that these guidelines are followed as well as any bidding requirements.

- All minority contractors, subcontractors and suppliers within Cleveland County will be sent notice and a copy of these guidelines as well as a notice of specific projects to be bid. The County's Purchasing Officer will provide this notification
- County's Purchasing Officer will establish an area in his/her office where bidding documents may be reviewed
- County's Purchasing officer or the Architect will hold pre-bid conferences to orient contractors and subcontractors to the County of Cleveland's policy and its bid procedures. Special invitations will be issued to minority contractors and subcontractors.

As required by GS143-128.2(e) a public agency must make good faith efforts in construction and repair projects. In addition to the specifications required in the above mentioned statute, the County of Cleveland will also perform the following duties to ensure that a good faith effort is made by the single prime contractors.

To ensure good faith efforts by the single prime contractors, the County's Purchasing officer will:

- Furnish each prospective bidder with a list of minority subcontractors in the bidding area
- Require documented assurance that the single prime contractor has solicited bids from minority subcontractors. Contractors are to show evidence of:
 - Subcontractors who were contracted; with minority subcontractors identified
 - Subcontractors that responded and which ones submitted bids; with minority subcontractors identified
 - Subcontractors to whom contracts were awarded; with minority subcontractors identified
- Hold conferences to orient contractors to the County's policy and percentage goals and to the documentation requirements
- A single prime contractor's bid may be rejected because no good faith effort was undertaken to assure minority business participation in the bidding process. A bid may not be rejected for lack of minority participation in the contract itself. It is the responsibility of the County's Purchasing Officer to make sound judgment as to compliance with good faith requirements. If the Purchasing Officer finds a lack of compliance, the bids will be considered not in compliance or a non-responsible bid before a determination as to whether it is the lowest responsible bid.

POLICY STATEMENT ON NON-DISCRIMINATION IN PURCHASING ACTIVITIES

It is the policy of the County of Cleveland to provide minorities and women equal opportunity to participate in all aspects of County contracting and purchasing programs, including but not limited to participation in procurement contracts for commodities and services as well as for contracts relating to construction, repair work, and/or leasing activities.

It is further the policy of the County of Cleveland to prohibit discrimination against any person or business in pursuit of these opportunities on the basis of race, color, sex, religion or national origin and to conduct its contracting and purchasing programs so as to prevent such discrimination.

The County of Cleveland, in cooperation with other local, state and federal agencies, and with the assistance of minority groups and agencies, will actively seek and identify qualified minority and women business enterprises and offer them the opportunity to participate as providers of goods and services to the County.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Access to site.
 - 4. Work restrictions.
 - 5. Specification and drawing conventions.
 - 6. Miscellaneous Provisions

1.3 PROJECT INFORMATION

- A. Project Identification: Foothills Public Shooting Complex Improvements Skeet and Trap Expansion.
 - 1. Project Location: 283 Fielding Road, Cherryville, North Carolina 28021.
- B. Owner: Cleveland County, Shelby North Carolina
 - 1. Owner's Representative: Brian Epley, County Manager, Cleveland County
- C. Designer / Engineer Identification: The Contract Documents were prepared for Project by The John R. McAdams Company, Inc., 2905 Meridian Parkway, Durham, North Carolina 27713 and its sub-consultants (S&ME, Inc., and RDK Engineers).
- D. Construction Manager:
 - 1. Construction Manager for this Project is Project's constructor. In Divisions 01 through 33 Sections, the terms "Construction Manager" and "Contractor" are synonymous.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents and consists, generally, of the following:
- B. Base Bid:
 - 1. Skeet and Trap Expansion – Construction of new access road with culvert/walls to connect to existing shooting range parking lot, maintenance to existing haul road, excavation and earth moving to Cleveland County Landfill stockpile, installation of sediment/riser basin, additional gravel parking lot, excavation and relocation of two existing trap houses and electrical services, installation of one skeet range, one combination skeet/trap combination range, one 5-Stand, one trap range and associated concrete sidewalks.
- C. Alternates:

1. Offsite Parking – excavation and earth moving to Cleveland County Landfill stockpile, installation of new gravel parking lot, sliding security gate, concrete drive entrance with culvert and adjusting an existing drop inlet to grade.
 2. Paving proposed gravel parking lot serving the skeet/trap range expansion.
 3. Electrical Service – Electrical installation beyond the proposed pad mounted transformer, serving the various range locations, as shown on sheet E.100.
- D. Type of Contract
1. Project will be constructed under a single prime bid and contract with the Owner.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Project limits (i.e. limits of disturbance) and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to areas within the Project limits (i.e. limits of disturbance) indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
- C. Firearms: No firearms, concealed or otherwise, are permitted on site. Since there are multiple project locations within the campus, Contractor shall post a notice at entrance to each project site.

1.6 OWNER OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of project, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
1. Designer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. Nonsmoking Campus: Smoking is not permitted within any of the campus buildings or within 25 feet of entrances, operable windows, or outdoor air intakes.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 72 hours minimum in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without the Owner written permission.
- D. Vibration and Odors: Coordinate operations that may result in high levels of vibration, odors or other disruption to Owner occupancy with Owner:
 - 1. Notify Owner not less than two working days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Employee Identification: Provide identification for Contractor personnel working on Project site. Require personnel to use identification at all times.
- F. Employee Screening: Comply with Federal Drug-Free Workplace Act of 1988 requirements (<http://www.dol.gov/elaws/asp/drugfree/require.htm>) for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat 2014" numbering system.
- B. The Specifications are directed to the Contractor. Requirements expressed as directions are to be performed by Contractor or by sub-contractors under his direction. Occasionally, for clarity, requirements for Work to be performed by Contractor, indirectly by the Contractor, or by Others will be so stated.
- C. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular context. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- D. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- E. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used

in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

MISCELLANEOUS PROVISIONS

- F. Contractor shall be responsible to monitor, police, and control its employees and its subcontractors with regard to the following:
 1. No guns or weapons allowed on the project site.
 2. No drugs or alcohol allowed on the project site.
 3. Clothing, language and actions shall not be abusive, lewd or offensive to the general public on or near the project site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. If necessary, additional requirements will be issued by Change Order according to unit prices established on the bid form. Include defined costs associated with allowances in base bid.
 - 2. All costs for performing the work described under this section shall be included in the allowance. These costs include materials, delivery, installation, taxes, insurance, equipment rental, and similar costs, and Contractor's overhead and profit.
- B. Types of allowances include the following:
 - 1. Quantity allowances.
- C. Related Sections:
 - 1. Division 01 Section "Unit Prices" for procedures for using unit process.

1.3 SUBMITTALS

- A. Submit invoices, delivery slips, or testing agency reports to show actual quantities of materials delivered to the site for fulfillment of each allowance.

1.4 UN-USED OR ADDITIONAL MATERIALS

- A. If the total amount of the allowance(s) is not used, the final contract amount will be reduced by the amount of allowances remaining times the unit price quoted by the Contractor on his / her bid form. This shall be credited to the Owner by deduct change order prior to approval of Final Application for Payment. If a greater amount of allowance(s) is used, the final contract price will be increased by the additional **unit measurement** times the same price quoted on his / her bid form through the change order process.
- B. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Additional excavation of material as requested by the Owner, which will include hauling and placement on the County landfill property. Quantity of 100 cubic yards.
- B. Allowance No. 2: Cost of material and placement of geotextile stabilization fabric (i.e. Mirafi 500x or equivalent) or geogrid (i.e. BX-1100 or equivalent). Quantity of 30 square yards.
- C. Allowance No. 3: Removal of mass/bulk rock, as approved by Owner's Testing Agency and offsite disposal. Quantity of 50 cubic yards.
- D. Removal of trench rock, as approved by Owner's Testing Agency, and offsite disposal. Quantity of 10 cubic yards.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.
 - 2. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 3. Division 01 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Additional excavation of material as requested by the Owner, which will

include hauling and placement on the County landfill property.

1. Description: Earth moving according to Division 31 Section 312000 "Earth Moving."
 2. Unit of Measurement: Per 100 Loose Cubic Yards
- B. Unit Price No. 2: Cost of material and placement of geotextile stabilization fabric (i.e. Mirafi 500x or equivalent) or geogrid (i.e. BX-1100 or equivalent).
1. Description: Earth moving according to Division 31 Section 312000 "Earth Moving."
 2. Unit of Measurement: Per 1 Square Yard
- C. Unit Price No. 3: Removal of Mass/Bulk Rock, as approved by Owner's Testing Agency, and offsite disposal.
1. Description: Earth moving according to Division 31 Section 312000 "Earth Moving."
 2. Unit of Measurement: Per 1 Bank Cubic Yard
- D. Unit Price No. 4: Removal of Trench Rock, as approved by Owner's Testing Agency, and offsite disposal.
1. Description: Earth moving according to Division 31 Section 312317 "Trenching."
 2. Unit of Measurement: Per 1 Bank Cubic Yard

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

3.1 SCHEDULE OF ALTERNATES

- A. Alternate #1: Site work for offsite gravel parking lot off Fielding Road (as shown in plan set Foothills Shooting Complex Improvements – Skeet and Trap Expansion, sheets C-7, C-8 and C-9).
- B. Alternate #2: Paving the main parking lot (as shown in plan set Foothills Shooting Complex Improvements – Skeet and Trap Expansion).
- C. Alternate #3: Electrical installation beyond the proposed pad mounted transformer, serving the various range locations, as shown on sheet E.100.

END OF SECTION 012300

SECTION 012500 - LIQUIDATED DAMAGES

1.1 COMPLETION OF WORK

- A. All work must be completed within 180 calendar days from Notice to Proceed. The Contractor shall pay the Owner as fixed, agreed and liquidated damages for each calendar day of delay beyond the stated number of days, until the work is completed, the sum of Five Hundred Dollars (\$500) per day. This includes but is not limited to all punch list items and required building inspections for Certificate of Occupancy. Requests for delays due to inclement weather will be evaluated and considered.

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 MINOR CHANGES IN THE WORK

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

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Designer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Designer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 7 days after receipt of Proposal Request, Contractor shall submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Designer.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change. In addition, please refer Article 19 of the General Conditions for additional items that shall be included in "net cost."
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CONSTRUCTION CHANGE DIRECTIVE

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

PART2-PRODUCTS(Not Used)

PART3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
 - 2. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
 - 3. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - 2. Submit the Schedule of Values to Designer at earliest possible date but no later than 10 days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Designer.
 - c. Designer's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.

- b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - a. Include separate line items under required principal subcontracts for punch list activities and Project Record Documents.
 - b. Include separate line items for mobilization, demobilization, close out, punchlists/inspections and for each milestone in the schedule.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 6. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Designer and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Designer.
- C. Payment Application Forms: Use EJDC Document C-620 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Designer will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued

before last day of construction period covered by application.

- E. Transmittal: Submit 5 signed and notarized original copies of each Application for Payment to Designer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the Following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Products list (preliminary if not final).
 - 5. Schedule of unit prices.
 - 6. Submittal schedule (preliminary if not final).
 - 7. List of Contractor's staff assignments.
 - 8. List of Contractor's principal consultants.
 - 9. Copies of building permits.
 - 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 11. Initial progress report.
 - 12. Report of preconstruction conference.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.
4. Contractor's Affidavit of Payment of Debts and Claims.
5. Contractor's Affidavit of Release of Liens.
6. Consent of Surety to Final Payment.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.
10. All other requirements outlined in General and Supplemental Conditions.

PART2-PRODUCTS(Not Used)

PART3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Administrative and supervisory personnel.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field- engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Designer, or Contractor seeking information from each other during construction.

1.4 COORDINATION

- A. Coordination: Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Contractor shall coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of

attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.

1.5 SUBMITTALS

- A. Key Personnel Names: Within **15** days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project
1. Include the names of the following inspectors as applicable, in accordance with schedule of inspections list and personnel approved by Owner and Authorities Having Jurisdiction:
 - a. Independent building inspectors
 - b. Special Inspectors
 2. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
- B. Subcontractor List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work.
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Name and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, Contractor shall prepare and submit an RFI on the Contractor's standard form or on CSI form 13.2A.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or

interpretation and the following:

1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Designer.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions and details of affected materials, assemblies, and attachments.
- C. RFI Forms: Contractor's standard form or on CSI form 13.2A
- D. Designer's and Owner's Action: Designer and Owner will review each RFI, determine action required, and respond. Allow ten (10) working days for Designer's response for each RFI. RFIs received by Designer after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Designer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Designer's action may include a request for additional information, in which case Designer's time for response will date from time of receipt of additional information.
 3. Designer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Designer and Owner in writing within **10** days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B or similar with not less than the following:

1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Designer.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI Description.
 6. Date the RFI was submitted.
 7. Date Designer's response was received.
 8. Identification of related Minor Change in the Work and Proposal Request, as appropriate.
- F. On receipt of Designer's and Owner's action, review response and notify Designer and Owner within **seven** days if Contractor disagrees with response.

1.7 PROJECT MEETINGS

- A. General: Designer will schedule and conduct the pre-construction, pre-installation, progress, and project close-out meetings and record and distribute the minutes for each. Meetings will be held at Project site, unless otherwise indicated.
1. The Superintendent shall represent the General Contractor at Project Meetings.
 2. Attendees: Inform participants and others involved, including inspectors, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Designer of scheduled meeting dates and times.
 3. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 4. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Contractor, within three days of the meeting.
- B. Preconstruction Meeting: Designer will schedule and conduct a preconstruction meeting before starting construction, at a time convenient to Owner and Designer, but no later than 15 days after execution of the Agreement. Meeting will be held at Project site or another convenient location. Designer will conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Designer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.

- j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
3. Minutes: Designer will record and distribute meeting minutes.
- C. Pre-installation Meetings: Conduct pre-installation meetings at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.

- q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: The Designer will conduct progress meetings at monthly intervals.
1. Attendees: In addition to authorized representatives of Owner, Designer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other entities concerned with current progress or involved in planning, coordination, or performance of future activities shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect or delay progress. Include topics for discussion as appropriate to the status of the project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited and secure commitments from parties to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review schedule for the next period.
 - c. Review present and future needs of each entity present, including the following:
 1. Sequence of operations
 2. Status of submittals
 3. Deliveries
 4. Access
 5. Site utilization
 6. Temporary facilities and controls
 7. Work hours
 8. Hazards and risks
 9. Progress cleaning
 10. Quality and work standards

11. Status of correction of deficient items
 12. Field observations
 13. RFIs
 14. Status of proposal requests
 15. Pending changes
 16. Status of change orders
 17. Pending claims and disputes
 18. Documentation of information for payment requests
3. Minutes: Designer will record and distribute meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
 5. Weekly Field Construction Meetings:
 - a. Attendance: It is required that the Contractor's Project Manager or other representative and superintendent also attend weekly status meetings with the Designer or Designer's representatives at the project site.
 - b. Issues discussed at weekly meetings and construction observations will be noted in the Designer's observation reports.
- E. Project Closeout Conference: Contractor will schedule and conduct a Project closeout conference, at a time convenient to Owner and Designer, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Designer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.

- k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Site condition reports.
 - 6. Special reports.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

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

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A significant construction area or element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format: PDF electronic file.
- B. Preliminary construction schedule.
1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- C. Preliminary Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Submit a working electronic copy of schedule and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- F. Daily Construction Reports: Submit at weekly intervals.
- G. Field Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Designer's request.

1.6 COORDINATION

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

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each project area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than **20** days, unless specifically allowed by Designer.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Designer's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 - 5. Punch List and Final Completion: Include not more than the days indicated in the Agreement for punch list and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Work under More Than One Contract: Include a separate activity for each contract.
 - 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.

- b. Uninterruptible services.
 - c. Use of premises restrictions.
 - d. Seasonal variations.
 - e. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Fabrication.
 - e. Deliveries.
 - f. Installation.
 - g. Tests and inspections.
 - h. Adjusting.
 - i. Curing.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
- G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered RFIs.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
- H. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- J. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's construction schedule using a computerized cost

time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 Thirty days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Designer's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Punch list and final completion.
 - i. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Designer's approval prior to assigning costs to fabrication and delivery activities. Assign costs under principal subcontracts for testing activities, punch list activities, and Project record documents.

- a. Each activity cost shall reflect an appropriate value subject to approval by Designer.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
1. Construction out of normal sequence will not be allowed without agreement of design team and Owner.
 2. Stalled project record. The General Contractor and all subcontractors shall make full use of all available calendar days. If no work is observed in a reasonable time when it is available, this condition will be documented by the design team and Owner. Should this condition affect future work, the amount of time when no work was observed will be deducted from potential future requests for time extensions.
- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates:
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

- a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
- b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (refer to special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Services connected and disconnected.
 16. Partial completions and occupancies.
 17. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three business days before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Designer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Pre-construction photographs.
 - 2. Periodic construction photographs.
- B. See Division 01 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.2 SUBMITTALS

- A. Key Plan: Submit key plan of Project site with notation of vantage points marked for location and direction of each photograph. Include the same label information as the corresponding set of photographs.
- B. Construction Photographs: Submit one print of each digital image within seven days of taking photographs.
 - 1. Format: 4 by 6-inch smooth-surface matte prints on single-weight commercial-grade stock, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
 - 2. Identification: On back of each print provide an applied label or rubber-stamped impression with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Designer.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, and direction (by compass point).
 - 3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints. Identify electronic media with date photographs were taken. Submit images that have the same aspect ratio as the sensor, uncropped.

1.3 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.
 - 1. Contractor's staff may be approved by Designer upon advance written request.

1.4 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPEG format, with minimum sensor size of 2.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Designer.
- D. Preconstruction Photographs: Before starting construction, take color photographs of Project site and surrounding properties from different vantage points, as directed by Designer.
 - 1. Take 12 photographs to show existing conditions adjacent to the property before starting the Work.
 - 2. Take 12 photographs of existing buildings either on or adjoining the property to accurately record the physical conditions at start of construction.
- E. Periodic Construction Photographs: Take 6 color photographs weekly, with timing each month adjusted to coincide with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.
 - 3. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 6. Divisions 02 through 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Submittals: Written and graphic information and physical samples that require Designer's responsive action.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Designer for Contractor's use in preparing submittals according to section 013300(1.5).
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals,

as follows. Time for review shall commence on Designer 's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Designer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Designer.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Designer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - ii. Drawing number and detail references, as appropriate.
 - iii. Location(s) where product is to be installed, as appropriate.
 - iv. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Designer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Designer will discard submittals received from sources other than Contractor.
1. Transmittal Form: Use Contractor's standard form.
 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Designer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

- I. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked "Approved No exceptions Taken".
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals with mark indicating "Approved No Exceptions Taken" taken by Designer.

1.5 CONTRACTOR'S USE OF DESIGNER'S CAD FILES

- A. General: At Contractor's written request, copies of Designer 's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
 1. Contractor receipt of a CAD file from the Designer assumes agreement with the following Disclaimer.

At your request, The John R. McAdams Company, Inc. (JRM) is providing electronic files for your convenience and use subject to the following terms and conditions:

JRM's electronic files are compatible with AutoCad 14. JRM makes no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.

Data contained on these electronic files is part of JRM's instruments of service and shall not be used by you or anyone else receiving this data through or from you for any purpose other than as a convenience in the preparation of site plans for the referenced project. Any other use or reuse by you or by others, will be at your sole risk and without liability or legal exposure to JRM. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against JRM, its officer, directors, employees, agents or sub-consultants which may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold harmless JRM from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from your use of these electronic files.

The electronic files are not contract documents. Significant differences may exist between these electronic files and corresponding hard copy contract documents due to addenda, change orders or other revisions. JRM makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed contract documents prepared by JRM and electronic files, the signed contract documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements,

verify field conditions and coordinate your work with that of other contractors for the project.

Because of the potential that the information presented on the electronic files can be modified, unintentionally or otherwise, JRM reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by JRM and JRM makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall JRM be liable for any loss of profit or any consequential damages.

By opening and using the attached files you agree to the above.

2. Contractor shall provide Designer with a typed list of requested electronic files, including a description indicating the intended use of the files.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. General: Prepare and submit Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product.
 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Compliance with specified referenced standards.
 - h. Testing by recognized testing agency.
 - i. Application of testing agency labels and seals.
 - j. Notation of coordination requirements.
 4. Number of Copies: Submit 4 copies of Product Data, unless otherwise indicated. Designer will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Designer will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop work manufacturing instructions.
 - g. Schedules.
 - h. Design calculations.
 - i. Compliance with specified standards.
 - j. Notation of coordination requirements.
 - k. Notation of dimensions established by field measurement.
 - l. Relationship to adjoining construction clearly indicated.
 - m. Seal and signature of professional engineer if specified.
 - n. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
 3. Number of Copies: Submit four opaque copies of each submittal. Designer will retain one copy; remainder will be returned.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 DESIGNER'S ACTION

- A. General: Designer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Designer will review each submittal, make marks to indicate corrections or modifications required, and return it. Designer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Sample Stamp:

APPROVED
 APPROVED AS CORRECTED
 REVISE AND RESUBMIT
 NOT APPROVED

BY APPROVING AND SUBMITTING SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, THE CONTRACTOR REPRESENTS THAT HE HAS DETERMINED AND VERIFIED ALL MATERIALS, FIELD MEASUREMENTS, AND FIELD CONSTRUCTION CRITERIA RELATED THERETO, OR WILL DO SO, AND THAT HE HAS CHECKED AND COORDINATED THE INFORMATION CONTAINED WITHIN SUCH SUBMITTALS WITH THE REQUIREMENTS OF THE WORK AND OF THE CONTRACT DOCUMENTS.

THE CONTRACTOR SHALL NOT BE RELIEVED OF RESPONSIBILITY FOR ANY DEVIATION FROM THE REQUIREMENTS OF THE CONTRACT DOCUMENTS BY THE ARCHITECT'S OR ENGINEER'S APPROVAL OF SHOP DRAWINGS, PRODUCT DATA, OR SAMPLES UNLESS THE CONTRACTOR HAS SPECIFICALLY INFORMED THE ARCHITECT IN WRITING OF SUCH DEVIATION AT THE TIME OF SUBMISSION, AND THE ARCHITECT OR ENGINEER HAS GIVEN WRITTEN APPROVAL OF THE SPECIFIC DEVIATION. THE CONTRACTOR SHALL NOT BE RELIEVED FROM RESPONSIBILITY FOR ERRORS OR OMISSIONS IN THE SHOP DRAWINGS, PRODUCT DATA, OR SAMPLES BY THE ARCHITECT'S OR ENGINEER'S APPROVAL.

THE JOHN R. McADAMS COMPANY, INC.

BY _____ DATE _____

- C. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and observation services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities.
 - 2. Specified tests, observations, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Designer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality Assurance (QA): Testing, procedures, observations, and activities performed on behalf of the Owner before and during execution of the Work to guard against defects and deficiencies and to substantiate that construction complies with all requirements. QA also insures the Contractor is effectively performing Quality Control.
- B. Quality-Control (QC): Planning, procedures, tests, inspections, and related actions performed by the Contractor before, during, and after execution of the Work to insure that products and construction comply with all requirements.
- C. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- F. Testing Agency: An entity engaged to perform specific tests, observations, or both. Testing laboratory shall mean the same as testing agency.
- G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an

employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Designer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Designer for a decision before proceeding.

1.5 SUBMITTALS

- A. Shop Drawings
- B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- C. Contractor's Quality-Control Manager Qualifications: For supervisory personnel.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Designer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. **Project quality-control manager may also serve as Project superintendent.**
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Designer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and re-inspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and observations indicated, as documented according to ASTM E 329 and with additional qualifications specified in individual Sections;

and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, observation, and similar quality-assurance service to Designer, and Commissioning Authority, with copy to Contractor. Interpret tests and observations and state in each report whether tested and observed work complies with or deviates from the Contract Documents.

1.9 QUALITY CONTROL

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

- certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, o of completed portions of the Work, and submittal of written reports.
- E. Re-testing/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including re-testing and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Designer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Designer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-

assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of the Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses. .
 1. Distribution: Distribute schedule to Owner, Designer, testing agencies and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Designer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Designer, with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Re-testing and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair

damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014533 – TESTS AND INSPECTIONS

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.
- B. Refer to individual technical specification sections for specific qualifications, inspections, tests, frequency and standards required.

1.2 SUMMARY

- A. Provide for any additional inspection and testing required by public authorities having jurisdiction.
- B. Owner will arrange and pay for following testing and observations:
 - 1. Soil compaction testing.
 - 2. Observation and evaluation of proofrolling operations
 - 3. Verification of rock and soil quantities.
 - 4. Concrete testing and evaluation.
 - 5. Observation and testing during full-depth reclamation (FDR).
 - 6. Quality assurance observation and testing for asphalt placement.
 - 7. If required, special inspections required by Section 1704 of the North Carolina Building Code.
- C. Contractor responsible for the work to be tested shall arrange and pay for following testing and inspections:
 - 1. Re-testing of Owner provided tests due to failure (Owner will arrange through Designer).
 - 2. Asphalt and concrete testing for qualification of materials and for Contractor's convenience
 - 3. Contractor's duties for Owner provided tests, as specified.
 - 4. All other testing and inspections specified.

1.3 QUALITY ASSURANCE

- A. Test and inspection method standards: See technical sections.
- B. Qualifications of independent testing agencies:
 - 1. Meet American Council of Independent Laboratories, "Recommended Requirements of Independent Laboratory Qualification", latest edition.
 - 2. Meet requirements of ASTM-E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as used in Construction", latest edition.
 - 3. Satisfy inspection criteria of Materials Reference Laboratory of National Bureau of Standards.
 - 4. See technical sections for additional requirements.

- C. Testing equipment calibration: By accredited calibration agency, at maximum 12-month intervals, by devices of accuracy traceable to either:
 - 1. National Bureau of Standards.
 - 2. Accepted values of natural physical constants.

1.4 JOB CONDITIONS

- A. Employment of independent testing agency by Owner does not relieve obligation to comply with Contract Documents.

PART 2 - NOT USED

PART 3 – EXECUTION

3.1 PERFORMANCE

- A. Perform indicated observations, inspections, sampling and testing of materials and methods of construction.
- B. Use test/inspection/sampling methods conforming with methods indicated.
- C. Report each test/inspection/sampling as indicated.
- D. Report results called for by test method, in form specified.
- E. Retest failed products and systems.

3.2 REPORTS

- A. Submit reports promptly.
- B. Include for test/inspection reports:
 - 1. Project name and number.
 - 2. Project location.
 - 3. Product and specification section applicable.
 - 4. Type of test/observation/inspection.
 - 5. Name of testing agency (if used).
 - 6. Name of testing/observing/inspecting personnel.
 - 7. Date of test/observation/inspection.
 - 8. Record of field conditions encountered (temperature, weather).
 - 9. Observations regarding compliance.
 - 10. Test method used.
 - 11. Results of test.
 - 12. Date of report.
 - 13. Signature of testing/observing/inspecting personnel

3.3 INDEPENDENT TESTING AGENCY DUTIES AND LIMITATIONS OF AUTHORITY

- A. Cooperate with Designer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Promptly notify Designer and Contractor of irregularities, or deficiencies of work which are observed during performance of services.
- D. Testing agency is not authorized to:
 - 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of Work.
 - 3. Perform any duties of Contractor.

3.4 CONTRACTOR'S DUTIES WHEN INDEPENDENT TESTING AGENCIES ARE USED

- A. Cooperate with testing agency personnel; provide access to the work and to manufacturer's operations.
- B. Provide preliminary representative samples of materials to be tested, in required quantities.
- C. Furnish labor and facilities:
 - 1. To provide access to work to be tested.
 - 2. To obtain and handle samples at site.
 - 3. To facilitate observations, inspections, and tests.
 - 4. Storage and curing facilities for testing agency's exclusive use.
- D. Notify Owner sufficiently (at least 24 hours) in advance of operations to allow for proper notification of Owner's testing agency.

3.5 ADDITIONAL INSPECTIONS

- A. In addition to the specified inspections, the Owner intends to conduct the following inspections, which contractors should allow for in their schedules:
 - 1. Pre-final inspections.
 - 2. Special inspections as required by Section 1704 of the North Carolina Building Code. See Section 014000 Special Inspections.
 - 3. Final inspection.
- B. Any of these inspections which are not completed satisfactorily shall be repeated at no cost to the Owner and without time extension.

END OF SECTION 014533

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution" for progress cleaning requirements.
 - 4. Division 31 Section "Dewatering" for disposal of ground water at Project site.
 - 5. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
 - 6. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement.

1.3 USE CHARGES

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

1.4 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, construction phasing, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more

stringent.

- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch , 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F .
 - 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
 - 6. Wireless and/or wired high speed internet connectivity for occasional use by Owner and/or Designer.
 - 7. Desk and chair for occasional use by Owner and/or Designer.
 - 8. Coffee maker and supplies.

- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service underground, unless otherwise indicated.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:

- a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments (including College's Police department).
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Owner's office.
 - f. Designers' offices.
 - g. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- H. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, and high-speed internet connection in common-use facilities.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Designer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated within construction limits indicated on Drawings.
 1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install sub-base and base for temporary roads and paved areas according to Division 32 Section "Asphalt Paving."
 3. Recondition base after temporary use, including removing contaminated material, re-grading, proof-rolling, compacting, and testing.
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
 3. Provide flaggers as necessary to ensure safety of campus personnel, students, and visitors.
- E. Parking: Provide temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated below. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as required (even if not indicated on Drawings) to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined

sufficient to accommodate construction operations.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting. If necessary, as determined by the Owner or other regulatory agencies (e.g. NCDOT) and even if not shown on the Drawings, Contractor shall provide temporary barricades, warning signs, and lights (at no additional cost to the Owner), to provide safety for the public and individuals seeking entry to the Project.
- I. Temporary Egress: **Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.**
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other

petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 017300 - EXECUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Cutting and patching.
 - 4. Protection of installed construction.
 - 5. Progress cleaning.
 - 6. Correction of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for limits on use of Project site.
 - 2. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 3. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 5. Division 02 Section "Selective Site Removal" for demolition and removal of existing site improvements.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Certified Surveys: Submit two (2) copies signed by land surveyor.
- D. Final Property Survey: Submit three (3) copies showing the Work performed and record survey data to include GIS/GPS coordinates for all below grade utilities.
- E. Cutting and Patching Proposal: Submit a proposal to the Owner describing procedures

well in advance of the time cutting and patching will be performed to determine if the Owner and/or Designer require approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction.
3. Describe affects to efficiency, maintenance, or safety of any operational element.
4. Describe affects to Work of Owner.
5. List products to be used and firms or entities that will perform Work.
6. Indicate dates when cutting and patching will be performed.
7. **Utilities:** List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
8. Approval by the Owner to proceed with cutting and patching does not waive the Owner and / or Designer's rights to later require complete removal and replacement of unsatisfactory Work.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Control systems.
 - c. Communication systems.
 - d. Conveying systems.
 - e. Electrical wiring systems.
- C. Cutting and Patching Meeting: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Designer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Designer according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Designer promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each area of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.

5. Check the location of every major element as the Work progresses.
 6. Notify Designer when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Designer.

3.4 FIELD ENGINEERING AND SURVEYING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Designer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Designer before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of major site improvements and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities (GIS/GPS coordinates for all below grade), existing improvements and significant vegetation, adjoining properties, acreage, grade contours, constructed impervious areas, and the distance and bearing from a site corner to a legal point.

3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without

delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."
- C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.
 1. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 2. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 3. Proceed with patching after construction operations requiring cutting are complete.
- E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean as appropriate.
- D. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls" and Division 01 Section "Construction Waste Management and Disposal."
- E. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.
- F. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Maintain conditions that ensure installed Work is without damage or deterioration at time of Final Acceptance.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75% by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
 - 1. Demolition Waste
 - a. Asphalt paving
 - b. Concrete
 - c. Concrete reinforcing steel

- d. Structural and miscellaneous steel
 - e. Rough hardware
 - f. Roofing
 - g. Insulation
 - h. Metal panels
 - i. Curtain wall frame members
 - j. Glazing
 - k. Supports and hangers
 - l. Electrical conduit
 - m. Copper wiring
 - n. Lighting fixtures
2. Construction Waste:
- a. Site-clearing waste.
 - b. Masonry and CMU.
 - c. Lumber.
 - d. Wood sheet materials.
 - e. Wood trim.
 - f. Metals.
 - g. Roofing.
 - h. Insulation.
 - i. Carpet and pad.
 - j. Gypsum board.
 - k. Piping.
 - l. Electrical conduit.
 - m. Packaging: Regardless of salvage/recycle goal indicated in "General" paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.5 SUBMITTALS

- A. Waste Management Plan: Submit plan within **30** days of date established for the Notice to Proceed.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit a report including the following information:
 - 1. Material category.

2. Generation point of waste.
 3. Total quantity of waste in tons.
 4. Quantity of waste salvaged, both estimated and actual in tons.
 5. Quantity of waste recycled, both estimated and actual in tons.
 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of- Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of Projects with similar requirements, that employs a LEED Accredited Professional, certified by USGBC, as waste management coordinator. Waste management coordinator may also serve as LEED coordinator.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Provide a report to include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Provide a report to include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 1. Distribute waste management plan to entities when they first begin work on-site.

Review plan procedures and locations established for salvage, recycling, and disposal.

- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

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

3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

3.4 DISPOSAL OF WASTE

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

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Partial Utilization (Beneficial Occupancy)
 - 2. Final Completion Prerequisites
 - 3. List of Incomplete Items (Punch List)
 - 4. Final Cleaning
 - 5. Final Inspection
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings and Record Specifications.
 - 3. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 PARTIAL UTILIZATION (BENEFICIAL OCCUPANCY)

- A. Beneficial Occupancy: The Owner may use a specified part of the project without significant interference with construction of the other parts of the project.
- B. Permission to use part of the project by the Owner shall be obtained from the contractor.
- C. The Designer shall schedule and conduct a beneficial occupancy inspection, with the approval of the Owner.
 - 1. Beneficial occupancy or partial utilization of the project shall not be permitted until all life safety is satisfactorily inspected by the Designers.
 - 2. Refer to General Conditions, Article 24, for specific information.

1.4 FINAL COMPLETION PREREQUISITES

- A. Preliminary Procedures: Before requesting inspection for determining date of Final Completion, complete the following.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 3. Prepare and submit Project Record Documents, Final Completion construction

photographs, damage or settlement surveys, property surveys, and similar final record information.

4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner.
5. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
6. Complete final cleaning requirements.
7. Provide a final Stair and Ramp survey, by a surveyor or engineer registered in the state of North Carolina, for all installed stairs and ramps, to verify compliance of stair width, stair tread depth and riser height, ramp slope, railing heights and other requirements of the NC State Building Code and conformance with the drawings.
8. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
9. Submit a written request for final inspection for acceptance to Designer. On receipt of request, Designer will either proceed with inspection or notify Contractor of unfulfilled requirements. Designer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Include name and identification of areas affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or other Designer approved form.
 1. Organize list of areas in sequential order.
 2. Organize items applying to each area by major element.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Designer.
 - d. Name of Contractor.
 - e. Page number.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION

3.1 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of areas affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or other Designer approved form.
 1. Organize list of areas in sequential order.
 2. Organize items applying to each area by major element.

3. Include the following information at the top of each page:
 1. Project name.
 2. Date.
 3. Name of Designer.
 4. Name of Contractor.
 5. Page number.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal." Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.
- C. Complete the following cleaning operations before requesting inspection for certification of Final Completion for entire Project or for a portion of Project:
 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits, including stains associated with asphalt paving and soil earthwork (e.g. stains on speed tables and newly constructed sidewalks).
 3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 4. Remove tools, construction equipment, machinery, and surplus material from Project site.
 5. Remove snow and ice to provide safe access to building.
 6. Leave Project clean and ready for occupancy.

3.3 FINAL INSPECTION

- A. Inspection: Submit a written request for inspection for Final Completion. On receipt of request, Designer will complete a preliminary inspection and prepare a list of discrepancies (punch list) for the contractor(s). A copy of the punch list will be sent to the Owner prior to scheduling the final inspection. Contractor shall provide written notification that discrepancies have been completed; Designers shall verify the completeness of the project and schedule a formal final inspection.
 1. Final inspection will not be scheduled until all contracts are complete unless approved by the Owner. Refer to General Conditions, Article 25, for exceptions.
 2. The date and time of the final inspection shall be set by the Designer and approved by the Owner. The Designer will furnish written notice of the inspection not less than seven (7) days prior to the inspection. Notice shall be sent to the Owner, the contractors concerned, the Designers concerned, and regulatory agencies exercising jurisdiction on the project.
 3. The Designers shall be responsible for conducting the inspection in the presence of the above listed parties, and shall tabulate a punch list of defects or discrepancies (if any) for correction by the responsible contractor(s). A scheduled time for completion of the punch

list items shall be established as required by contract. Copies of the list will be provided to all parties concerned.

4. Re-inspection: Upon notification by the contractor(s) that the discrepancies have been completed, the Designer shall schedule another inspection to verify all final punch list items. The Designer shall confirm in writing, the completion of all final punch list items by the contractor(s).
 - a. Final punch list items not completed by the contractor(s) within the established time of completion shall be dealt with in accordance with the terms of the contract.
- B. Completion of Project: The Designer shall compute total time for completion as allowed in the contract, plus any time extensions granted and determine the number of days, if any, in excess of the contract construction time for which the contractor(s) appear liable for liquidated damages.
 1. The Designers shall notify the contractor(s) of any proposed assessments of liquidated damages and allow the contractor(s) time to respond.
 2. The Designer shall then prepare recommendations to the Owner as to the amount of liquidated damages, if any, to be assessed to the contractor(s).
- C. Acceptance of Project: The Designer shall assemble written guarantees, affidavits, and other required and closing papers of the contractors; issue certificates of final completion and certificates of compliance as required by GS 133-1.1b.
 1. The Designer shall provide certificates of compliance to the Owner and to the surety company.
 2. Certificates of compliance shall also be provided by various in-house and contract consultants as required by law.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Marked-up Record Prints to be used in developing Record Drawings
 - 2. Record Specifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Close-Out" procedures for general close-out procedures.
 - 2. Divisions 02 through 033 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up Record Prints to be incorporated as Record Drawings by the Designer.
- B. Record Specifications: Submit one copy of marked-up Project's Specifications, including addenda and contract modifications to be incorporated as Record Documents by the Designer.
- C. One set of approved Submittals shall be kept for, and provided to, the Owner at the end of the project. Provide the following information on the Submittal and Submittal transmittal sheet, as appropriate: Project name, name of Designer, name of prime contractor, name of subcontractor, name of supplier, name of manufacturer, number and title of the appropriate specification section. Submittals to be provided to Owner organized by specification section in folders and provided in banker box/boxes.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.

- c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Scan completed Record Prints containing recorded changes and save data in current Windows file format required by Owner. Deliver files on CDROM or DVD medium.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Locations and depths of underground utilities.
 - d. Revisions to routing of piping and conduits.
 - e. Changes made by Change Order
 - f. Changes made following Designer's written orders.
 - g. Details not on the original Contract Drawings.
 - h. Field records for variable and concealed conditions.
 - i. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Change Order numbers, and similar identification, where applicable.
- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Designer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Designer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize Marked-Up Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Designer.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 2. Mark copy with the proprietary name and model number of products and material furnished, including substitutions
 3. Record the name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders and Record Drawings where applicable.

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project. Annotate concurrently with construction progress, not less than weekly, to show actual revisions to the Work.
- B. Maintenance of Record Documents and Samples: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Designer's reference during normal working hours.

END OF SECTION 017839

SECTION 024113 – SELECTIVE SITE REMOVAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. This section covers the labor and materials necessary for the Work associated with the demolition of on-site structures, sheds, , concrete sidewalks, asphalt paving, and curb and gutter, etc. on the Drawings and specified herein while maintaining continuous operation of the Owner's facilities.
 - 2. The information contained on Drawings showing demolition is based on the available record drawings and information from previous construction projects within the project area. The supplementary information and reference drawings are provided solely for the convenience of the Contractor. Neither the Engineer nor the Owner assumes any responsibility for the accuracy or completeness of these drawings or for the Contractor's interpretation of this supplementary information. The Contractor shall perform all demolition required regardless of type or amount. The Contractor shall inspect the facilities to be demolished as specified in Specifications, to satisfy itself as to the nature and location of the Work. Differences between the Contract Documents and the actual facilities shall not constitute grounds for time extension or contract modifications.
 - 3. Any utility to be relocated in order to facilitate construction should first be coordinated with the Owner or owning utility company before the utility is to be interrupted.

1.3 GENERAL

- A. Some obstructions may not be shown. This Contract shall include, as incidental to the Work, removal and replacement of obstructions such as water lines, electric lines, and similar items deemed by the Engineer to be required to meet the design intent shown in these Contract Documents, even though not shown or specifically mentioned.

1.4 DEFINITIONS

- A. Remove: Demolish complete as specified herein including offsite disposal except for those specific portions of removed items specified to be salvaged.
- B. Salvage: Detach and turn over to Owner removed portions of the Work in good working condition or credit the owner the price of the material or item.
- C. Standard Specifications: When referenced in this section, shall mean North Carolina Department of Transportation Road and Bridge Specifications, January 2012. Parts of these Standard Specifications that are specifically referenced shall become part of this section as though stated herein in full. In case of a discrepancy between the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.5 MATERIALS OWNERSHIP

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

1.6 SUBMITTALS

- A. Submittals shall be made in accordance with the Division 01 Section "Submittal Procedures". In addition, the following specific information shall apply:
 - 1. The Contractor shall submit to the Engineer for approval, schedules of demolition, including:
 - a. Detailed methods and phasing of demolition to be used within the project area including any interruption of existing utility services or access.
 - b. Copies of authorization, and permits, including any excavation permits, to remove the existing utility infrastructure as indicated on the Drawings.
 - c. Inventory of items to be removed and salvaged.
 - d. Pre-demolition photographs showing the existing conditions of adjoining construction and site improvements that might be misconstrued as damage cause by demolition operations.
 - e. Temporary protection measures
 - 2. The Contractor shall make all alterations in the schedule or methods required by the Engineer at the Contractor's sole expense.
 - 3. No demolition activities shall commence until schedules for demolition have been approved by the Engineer for the affected areas or activities.

1.7 COORDINATION

- A. Prior to beginning demolition work, clearly field-identify all items that are scheduled to be demolished and salvaged.
- B. Conduct a walk-through with the Owner to:
 - 1. Verify and agree to the items identified for demolition and salvage.
 - 2. Identify and resolve problems with the existing utility infrastructure that will be a result of the demolition Work.
- C. Do not interrupt any service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner's Representative no fewer than (72) hours in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Owner's Representative's written permission.

PART 2 PRODUCTS - Not applicable to this Section

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall set up construction facilities in a neat and orderly manner in accordance with Specifications. Contractor shall accomplish all Work in accordance with the applicable portions of these Specifications and as approved. All operations shall be confined to the Work area.

3.2 PERFORMANCE REQUIREMENTS

- A. All Work shall be performed in conformance with local, State, and federal rules and regulations pertaining to safety and as specified elsewhere in these Specifications.
- B. Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Comply with ANSI A10.6 and NFPA 241.
- D. Contractor shall obtain all necessary local, State, and federal permits (at no additional cost to the Owner) required for the demolition of the elements on site and complete all Work in conformance with local, State, and federal rules. In addition, contractor shall perform (at no additional cost to the Owner), any required inspections for lead, asbestos, or other hazardous materials prior to demolition and / or as part of obtaining any required demolition permits. The costs for disposing of these materials (if found) shall be part of the base bid.

3.3 DISPOSAL AND SALVAGE OF MATERIAL

- A. Contractor shall remove and properly dispose of all rubble and material from the Site unless otherwise specified or shown on the Drawings. This shall include, but not be limited to, the following: concrete rubble, underdrain piping, storm drainage piping, unsuitable backfill material, fences, brush, wood, and other debris. Contractor shall accomplish disposal offsite in accordance with local, State, and federal laws.

3.4 DEMOLITION ACTIVITIES AND PROTECTION

- A. The Contractor shall be responsible for having all appropriate services located and turned off before demolition is started. The Contractor shall excavate all utility lines to be demolished and shall provide a permanent leak-proof closure for all abandoned water, gas lines, and electrical conduits. Closures shall be made with caps or plugs specifically designed for the applicable piping system.
- B. Where abandoned utility lines are exposed by demolition excavation, they shall be removed. Likewise, all manholes shall be removed.
- C. Pipelines shall be sealed with plugs or caps of the same material as the line, with thrust restraint where applicable. Where plugs or caps are not available, abandoned lines shall be plugged with concrete to prevent groundwater infiltrating the abandoned lines. Work to be in accordance with Standard Specifications, see Construction Drawings for detail.
- D. Existing structures, boxes, pipes, and other items are to be removed, altered, re-located, salvaged, and / or disposed of as indicated on the Drawings or designated by the Engineer. All portions of these items that interfere with Work shall be removed and properly disposed.

- E. Under no circumstances is there to be discharge of any sewage into storm waters.
- F. Existing pavement, curb, walks, and associated items shall be removed and disposed of as indicated on the Drawings or designated by the Engineer. When partially removing pavement or curb, Contractor shall neatly saw cut at right angle to surface. All portions of these items that interfere with Work shall be removed and properly disposed.
- G. All portions of items designated to be removed shall be removed in the entirety and any resulting void shall be filled with compacted material, in accordance with Standard Specifications. The ends of abandoned pipes that are designated to be left in place shall be plugged, capped, or filled with concrete to provide a watertight seal as specified hereinbefore.
- H. The Contractor shall perform all Work in a manner that will not damage parts of the existing infrastructure not intended to be removed. If, in the opinion of the Engineer, the methods of removal, demolition, or cutting used may endanger or damage parts of the infrastructure or affect the satisfactory operation of the remaining infrastructure, the Contractor shall promptly change the method when notified by the Engineer. The Contractor shall examine the existing infrastructure and make a determination of required demolition and other conditions to be encountered in order to accomplish the Work. No blasting will be permitted for demolition activities.
- I. Repair and replacement of existing elements required due to Contractor activities shall be made at the Contractor's sole expense.

3.5 TEMPORARY PROTECTION MEASURES

- A. The Contractor shall perform all Work to prevent damage to all existing facilities and make all provisions necessary to protect the Owner's facilities from damage due the activities of the Contractor, including but not limited to, protection from dust, debris, water, humidity, and fumes.

3.6 SHUTDOWN OF EXISTING OPERATIONS AND UTILITIES

- A. Existing utilities including, but not limited to, water, gas, telecom, and other subsurface utilities, are required to remain in services during construction and modification of the new and existing infrastructure.
- B. All pedestrian, vehicular, and mobile equipment access shall be maintained during construction.
- C. Existing site lighting and security shall be maintained at equal or better conditions during construction.

END OF SECTION 024113

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Ready-mix concrete manufacturer.
 - c. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, forms and form removal limitations, anchor rod and anchorage device installation tolerances, steel reinforcement installation, and concrete protection.

1.4 ACTION SUBMITTALS

- A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- B. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.

- 2. Admixtures.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Special Inspections: All work is subject to Special Inspection as outlined in Spec Section 014001 and this section. The Contractor is responsible for leaving all work uncovered until verified by the Special Inspector and is responsible for notifying the Special Inspector to review work with a 48hr notice to minimize delay to the construction schedule. Verification by the Special Inspector is a requirement of the building official for issuance of the Certificate of Occupancy.
- B. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- D. Testing Agency / Special In Qualifications: An independent agency, acceptable to the Engineer of Record for concrete retaining walls.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Retain option in "Steel Reinforcement" Paragraph below if zinc- or epoxy-coated steel reinforcement is required.
- B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
 - 1. 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. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1/2 inch (25 mm) in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Revise this article to suit steel reinforcement requirements; delete if not required.
- B. Reinforcing Bars: ASTM A 615/A 615M, **Grade 60 (Grade 420)**, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, **Grade 60 (Grade 420)**, deformed bars, assembled with clips.
- D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- E. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- F. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- G. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Insert other products for dowels or dowel sleeves if required. These include circular and rectangular plastic dowel sleeves, square dowels, and plastic-surfaced or reinforced-paper-covered dowels.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II white,.
 - 2. Fly Ash: ASTM C 618, Class F.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: **1 inch (25 mm)** nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, **3/4 by 1 inch (19 by 25 mm)**.

2.7 CURING MATERIALS

- A. Evaporation retarders temporarily reduce moisture loss from concrete surfaces awaiting finishing in hot, dry, and windy conditions. Evaporation retarders are not curing compounds.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- C. 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.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- E. Water: Potable.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.8 RELATED MATERIALS

- A. Retain one or all options in "Expansion- and Isolation-Joint-Filler Strips" Paragraph below. Joint-filler strips are used in floor isolation joints.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to **ACI 301 (ACI 301M)**.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. This article contains examples of building elements that often need different concrete mixtures. Revise, consolidate, or add other building elements if more concrete mixtures are required.
- B. Footings: Normal-weight concrete.
 1. Minimum Compressive Strength: **3000 psi (20.7 MPa)** at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Slump Limit: **8 inches (200 mm)** for concrete with verified slump of **2 to 4 inches (50 to 100 mm)** before adding high-range water-reducing admixture or plasticizing admixture, plus or minus **1 inch (25 mm)**.
- C. Foundation Walls and other concrete not otherwise noted: Normal-weight concrete.
 1. Minimum Compressive Strength: **3000 psi (20.7 MPa)** at 28 days.
 2. Maximum W/C Ratio: 0.50 0.45 0.40 Insert number.
 3. Slump Limit: **8 inches (200 mm)** for concrete with verified slump of **2 to 4 inches (50 to 100 mm)** before adding high-range water-reducing admixture or plasticizing admixture, plus or minus **1 inch (25 mm)**.
 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for **1-1/2-inch (38-mm)** nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for **1-inch (25-mm)** nominal maximum aggregate size.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

- A. Retain option in "Ready-Mixed Concrete" Paragraph below if steel or synthetic fibers are required.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between **85 and 90 deg F (30 and 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.
- C. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of **1 cu. yd. (0.76 cu. m)** or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For 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 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Specify embedded items and anchorage devices for other work attached to or supported by cast-in-place concrete. Insert specific requirements for installing embedded items, if any, that are part of the Work.

- B. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

- A. Revise removal time in "General" Paragraph below if required. Period of 24 hours is halved to 12 hours in ACI 347. Commentary in ACI 318 (ACI 318M) recognizes 12 hours for concrete using regular portland cement but advises that this period may be insufficient for concrete using Type II and Type V portland cements or ASTM C 595/C 595M blended hydraulic cements, concrete with retarding admixtures, and concrete using ice during mixing.
- B. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 STEEL REINFORCEMENT INSTALLATION

- 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, and other foreign materials that reduce bond to concrete.
- C. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- D. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- E. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.5 JOINTS

- A. Coordinate joint types, description, and location with Drawings. Joint types are consolidated in this article for consistency rather than for strict sequence of installation.

- B. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- C. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least **1-1/2 inches (38 mm)** into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.6 WATERSTOP INSTALLATION

- A. Retain "Flexible Waterstops" or "Self-Expanding Strip Waterstops" Paragraph below, depending on type of waterstop required.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to **ACI 301 (ACI 301M)**.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least **6 inches (150 mm)** into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.8 FINISHING FORMED SURFACES

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

3.9 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. This article is an example only. Insert, revise, or delete items to suit Project.
- B. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- C. 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.
- D. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases **8 inches (200 mm)** high unless otherwise indicated and extend base not less than **6 inches (150 mm)** in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: **3000 psi (20.7 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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE PROTECTING AND CURING

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

3.11 JOINT FILLING

- A. Retain this article if joint filling is required.
- B. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least [one] [six] month(s). Do not fill joints until construction traffic has permanently ceased.

- C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- D. Install semirigid joint filler full depth in saw-cut joints and at least **2 inches (50 mm)** deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

- A. This article provides basic applications for repairing concrete surfaces. Revise or delete to suit Project.
- B. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- C. 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.
- D. 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. Limit cut depth to **3/4 inch (19 mm)**. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of **0.01 inch (0.25 mm)** wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of **1/4 inch (6 mm)** to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according

to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes **1 inch (25 mm)** or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a **3/4-inch (19-mm)** clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes **1 inch (25 mm)** or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- G. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Retain "Special Inspections" or "Testing Agency" Paragraph below.
- B. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Inspections as indicated in the Special Inspection documentation:
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding **5 cu. yd. (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.
 2. Testing Frequency: Obtain at least one composite sample for each **100 cu. yd. (76 cu. m)** or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; 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 C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two plus one (5 total) standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
9. 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).
10. 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.
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: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
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.

END OF SECTION 033000

SECTION 260100 – BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Submittals.
 - 2. Coordination drawings.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Electrical installations.

1.3 GLOSSARY

ACI	American Concrete Institute
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AFBMA	Anti-Friction Bearing Manufacturers' Association
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
AWWA	American Water Works Association
FM	Factory Mutual Insurance Company

IBR	Institute of Boiler & Radiation Manufacturers
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Institute
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
SBI	Steel Boiler Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UFPO	Underground Facilities Protective Organization
UL	Underwriters' Laboratories, Inc.
OSHA	Occupational Safety and Health Administration
UFPBC	Building Code

Approval/Approved	Materials, Equipment, or Methods deemed to be acceptable solely by the Engineer and documented in writing.
As Called For	Contractor shall provide materials, equipment and their execution specified/shown in the Contract Documents.
Code Requirements	Minimum requirements.
Concealed	Install work in pipe/duct shafts, building chases or recesses, inside of hollow wall construction, above ceilings, within floor slabs, or below grade.
Contractor	Person or persons responsible for the execution of this Contract, as governed by these construction documents.
Exposed	Work not identified as concealed.
Equal or Equivalent	Materials, Equipment, or Methods determined to be acceptable substitutions for specified design criteria.
Final Acceptance	Final project review where a previously established "punch list" will be used as the basis for determining project completeness and award of final payment.
Furnish	Supply and deliver to installed location.
Furnished By Others, Installed by Contractor	Receive delivery at jobsite, or where called for, and install.
Inspection	Visual observations by Owner's Site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a recognized testing and standards agency.
May	Allows contractor a choice.

Or Approved Equal	Materials, Equipment, or Methods determined to be acceptable substitutions for specified design criteria, solely by the Engineer and documented in writing.
Prime Professional	Architect or Engineer having a Contract directly with the Owner for professional services.
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport existing equipment to new location, then clean, test and install ready for use.
Replace	Remove existing equipment and/or item and provide new.
Review	A general contractual conformance check of specified products.
Roughing	Preliminary layout and installation of pipe, duct, conduit, equipment.
Satisfactory	As specified in Contract Documents.
Shall	Indicates a mandatory requirement.

1.4 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."
- B. Additional copies may be required by individual sections of these Specifications.
- C. Submittal Document Quality: Facsimile documents are prohibited. Submittals containing sheets copied from facsimile documents will be automatically Rejected and returned to Contractor without review. Also submittals containing poor quality copies will be automatically Rejected and returned to Contractor without review.

1.5 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "CONTRACT CLOSEOUT." In addition to the requirements specified in Division 1, indicate installed conditions for:
 - 1. Major raceway systems, size and location, for exterior locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.6 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "CONTRACT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
2. Maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
3. Servicing instructions and lubrication charts and schedules.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 33 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning.
 4. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 5. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 7. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

8. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
9. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 INSPECTIONS

- A. It is the responsibility of the Electrical contractor to notify the local authority having jurisdiction to schedule required inspections including rough-in and final inspections.

END OF SECTION 260100

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

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. Supporting devices for electrical components.
 2. Electrical identification.
 3. Electricity-metering components.
 4. Concrete equipment bases.
 5. Electrical demolition.
 6. Cutting and patching for electrical construction.
 7. Touchup painting.

1.3 SUBMITTALS

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch-diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs are not allowed.

2.2 GROUT

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

2.3 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch-diameter or larger threaded steel hanger rods, unless otherwise indicated.

- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts and machine screws, or standard pre-set inserts.
 - 5. Steel: Welded threaded studs or spring-tension clamps on steel.
 - 6. Field Welding: Comply with AWS D1.1. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 - 7. Light Steel: Sheet-metal screws.
 - 8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
3. Colors: As follows:
 - a. 208/120V Power System: Blue with white core.
 - b. 480/277V Power System: Black with white core.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 1. Phase A: Black.
 2. Phase B: Red.
 3. Phase C: Blue.
 4. Neutral: White.
 5. Ground: Green.
- G. Factory applied color coded insulation the entire length of all conductors.
- H. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
 1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
 2. Tag Fasteners: Nylon cable ties.
 3. Band Fasteners: Integral ears.
- I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

3.5 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove demolished material from Project site.
- E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.
- F. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.7 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Supporting devices for electrical components.
 - 2. Electrical identification.
 - 3. Electricity-metering components.
 - 4. Concrete bases.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.

3.8 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.9 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

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 building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NFPA 70, Comply with NEMA and IPCEA standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Wires and Cables:
 - a. American Insulated Wire Corp.; Leviton Manufacturing Co.
 - b. BICC Brand-Rex Company.
 - c. Carol Cable Co., Inc.
 - d. Senator Wire & Cable Company.
 - e. Southwire Company.
2. Connectors for Wires and Cables:
 - a. AMP Incorporated.
 - b. General Signal; O-Z/Gedney Unit.
 - c. Monogram Co.; AFC.
 - d. Square D Co.; Anderson.
 - e. 3M Company; Electrical Products Division.

2.2 CONDUCTORS AND CABLES

- A. UL-listed conductors and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Rubber Insulation Material: Comply with NEMA WC 3.
- C. Thermoplastic Insulation Material: Comply with NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- F. Conductor Material: Copper, soft, drawn, 98% conductivity.
- G. Stranding: Solid conductor for No. 10 AWG and smaller; class B stranded conductor for larger than No. 10 AWG.

2.3 CONNECTORS AND SPLICES

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine raceways and building finishes receiving wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

- A. Service Entrance: Type RHW or THWN, in raceway.
- B. Feeders: Type THHN/THWN, in raceway. All exterior conductors in raceway shall be rated THWN.
- C. Branch Circuits: Type THHN/THWN, in raceway. All exterior conductors in raceway shall be rated THWN.
- D. Class 1 Control Circuits: Type THHN/THWN, in raceway.
- E. Class 2 Control Circuits: Type THHN/THWN, in raceway.

3.3 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Branch Circuits:
 - 1. Minimum branch circuit conductor size No.12 AWG.
 - 2. New circuits shall consist of a dedicated phase conductor and a dedicated neutral conductor with a grounding conductor; it shall be permitted to share the grounding conductor. A maximum of three (3) phase conductors and three (3) dedicated neutral conductors with a shared grounding conductor shall be permitted in a single raceway (3/4" min.).
 - 3. Receptacle branch circuits: Each 120V, 20 ampere single pole receptacle circuit shall originate at the panelboard with a dedicated phase, neutral and ground conductor. 120V receptacle circuits are #12 AWG minimum, Multi-circuit homeruns shall not be permitted. Shared neutral conductors shall not be permitted.
 - 4. Existing receptacles that currently share a common neutral may remain as installed providing no modifications of the existing circuit are made where the circuits originate at the panelboard.
 - 5. Where phase conductors are increased in size due to any design factor, the neutral conductor shall be increased proportionally (per cross-sectional area – in circular mils) to meet NEC requirements. The ground conductor shall be increased to the corresponding correct size per NEC Article 250.122.
- C. Branch circuit wire sizes shall be increased to avoid excessive voltage drop as follows:
 - 1. Nominal 120 Volt Circuits: Increase one wire size for each 75 feet or portion thereof in excess of 50 feet between the panelboard and the first outlet.
- D. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- E. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- F. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- G. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

- H. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
- I. Identify wires and cables according to Division 26 Section "Basic Electrical Materials and Methods."

3.4 CONNECTIONS

- A. Conductor Splices: Keep to minimum except where noted on the drawings.
- B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- C. Use splice and tap connectors compatible with conductor material.
- D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.
- E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 TESTING

- A. General: Test all wire and cable for continuity and short circuits prior to energizing. Correct all faulted circuits when detected.
- B. Test shall be in accordance with NETA ATS-2003 Section 7.3.2. Minimum insulation resistance shall not be less than 100 megohms.
- C. Resistance Testing (required for all pedestal circuits and service conductors) :
 - 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:
 - 2. 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.
 - 3. 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 until source of the low reading is 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.
 - 4. At final inspection, the contractor shall furnish a megger and show the engineers and AHJ 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.
- D. The testing shall be performed by experienced qualified personnel.

- E. Notify the Designer at least one week in advance of test date(s).
- F. Provide a written test report to the designer within 24 hours after completion of each test. Testing information shall include; time of day, date, temperature and all pertinent test information.
- G. Submit all testing reports to the Office of the Engineer prior to substantial completion.

3.6 FIELD QUALITY CONTROL

- A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.
- B. The complete electrical installation shall be grounded and bonded in an approved manner per:
 - 1. NFPA 70 – National Electric Code

1.3 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- B. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erigo Inc.

- b. Boggs, Inc.
- c. Chance/Hubbell.
- d. Copperweld Corp.
- e. Dossert Corp.
- f. Erico Inc.; Electrical Products Group.
- g. Framatome Connectors/Burndy Electrical.
- h. Galvan Industries, Inc.
- i. Harger Lightning Protection, Inc.
- j. Hastings Fiber Glass Products, Inc.
- k. Heary Brothers Lightning Protection Co.
- l. Ideal Industries, Inc.
- m. ILSCO.
- n. Kearney/Cooper Power Systems.
- o. Korns: C. C. Korns Co.; Division of Robroy Industries.
- p. Lightning Master Corp.
- q. Lyncole XIT Grounding.
- r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
- s. Racor, Inc.; Division of Hubbell.
- t. Robbins Lightning, Inc.
- u. Salisbury: W. H. Salisbury & Co.
- v. Superior Grounding Systems, Inc.
- w. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Material: Copper, No.12 AWG minimum.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- F. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
 1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Flexible raceway runs.

- D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- E. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- C. Neutrals and bonding conductors shall be connected together only at the service entrance and where separately derived systems originate.
- D. Separately derived systems shall be securely grounded in accordance with the NEC. If the structural steel is utilized as the ground connection all bolted connections in the path to earth shall be provided with bonding jumpers.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Where concentric, eccentric or over-sized knockouts are encountered, a grounding-type insulated bushing shall be provided.
- H. EMT terminals and couplings shall be made utilizing steel-plated hexagonal compression connector. No pot metal, set screw or indented type fitting shall be utilized.
- I. IMC and GRC shall terminate with either a double locknut / bushing set, or in a threaded hub.

3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements. The contractor shall test the existing service grounding by the methods below to confirm that grounding is adequate.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 - 3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.

- b. Substations and Pad-Mounted Equipment: 5 ohms.
 - c. Manhole/Handhole Grounds: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
 - c. Thomas & Betts Corporation.
 - d. Unistrut; an Atkore International company.
 - e. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4 unless specifically noted otherwise on the drawings.
 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) MKT Fastening, LLC.
 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 5. Toggle Bolts: All-steel springhead type.
 6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where Table 1 lists maximum spacing less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with wood screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Metal expansion shields and machine screws or standard pre-set inserts.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Machine screws or through bolts.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
 - 8. Powder actuated fasteners shall be prohibited.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
 - 1. Raceways include the following:
 - a. RMC.
 - b. EMT.
 - c. FMC.
 - d. LFMC.
 - e. RNC.
 - f. Wireways.
 - 2. Boxes, enclosures, and cabinets include the following:
 - a. Device boxes.
 - b. Outlet boxes.
 - c. Pull and junction boxes.
 - d. Cabinets and hinged-cover enclosures.
- B. Related Sections include the following:
 - 1. Division 7 Section "Firestopping."
 - 2. Division 26 Section "BASIC ELECTRICAL MATERIALS AND METHODS" for raceways and box supports.
 - 3. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. LFMC: Liquidtight flexible metal conduit.
- D. RMC: Rigid metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NECA's "Standard of Installation."
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Metal Conduit and Tubing:
 - a. Alflex Corp.
 - b. Anamet, Inc.; Anaconda Metal Hose.
 - c. Anixter Brothers, Inc.
 - d. Carol Cable Co., Inc.
 - e. Cole-Flex Corp.
 - f. Electri-Flex Co.
 - g. Flexcon, Inc.; Coleman Cable Systems, Inc.
 - h. Grinnell Co.; Allied Tube and Conduit Div.
 - i. Monogram Co.; AFC.
 - j. Spiraduct, Inc.
 - k. Triangle PWC, Inc.
 - l. Wheatland Tube Co.
 - 2. Nonmetallic Conduit and Tubing:
 - a. Anamet, Inc.; Anaconda Metal Hose.

- b. Arco Corp.
 - c. Breeze-Illinois, Inc.
 - d. Cantex Industries; Harsco Corp.
 - e. Certainteed Corp.; Pipe & Plastics Group.
 - f. Cole-Flex Corp.
 - g. Condux International; Electrical Products.
 - h. Electri-Flex Co.
 - i. George-Ingraham Corp.
 - j. Hubbell, Inc.; Raco, Inc.
 - k. Lamson & Sessions; Carlon Electrical Products.
 - l. R&G Sloan Manufacturing Co., Inc.
 - m. Spiraduct, Inc.
 - n. Thomas & Betts Corp.
3. Conduit Bodies and Fittings:
- a. American Electric; Construction Materials Group.
 - b. Crouse-Hinds; Div. of Cooper Industries.
 - c. Emerson Electric Co.; Appleton Electric Co.
 - d. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - e. Lamson & Sessions; Carlon Electrical Products.
 - f. O-Z/Gedney; Unit of General Signal.
 - g. Scott Fetzer Co.; Adalet-PLM.
 - h. Spring City Electrical Manufacturing Co.
4. Metal Wireways:
- a. Hoffman Engineering Co.
 - b. Keystone/Rees, Inc.
 - c. Square D Co.
5. Boxes, Enclosures, and Cabinets:
- a. American Electric; FL Industries.
 - b. Butler Manufacturing Co.; Walker Division.
 - c. Crouse-Hinds; Div. of Cooper Industries.
 - d. Electric Panelboard Co., Inc.
 - e. Erickson Electrical Equipment Co.
 - f. Hoffman Engineering Co.; Federal-Hoffman, Inc.
 - g. Hubbell Inc.; Killark Electric Manufacturing Co.
 - h. Hubbell Inc.; Raco, Inc.
 - i. Lamson & Sessions; Carlon Electrical Products.

- j. O-Z/Gedney; Unit of General Signal.
- k. Parker Electrical Manufacturing Co.
- l. Robroy Industries, Inc.; Electrical Division.
- m. Scott Fetzer Co.; Adalet-PLM.
- n. Spring City Electrical Manufacturing Co.
- o. Thomas & Betts Corp.
- p. Woodhead Industries, Inc.; Daniel Woodhead Co.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Compression type.
 - 2. Color:
 - a. Fire Alarm System: Red
 - b. Controls: Purple
 - c. All other applications: Steel (no color)
- C. FMC: Zinc-coated steel.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings: NEMA FB 1; compression type compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
- B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2.4 METAL WIREWAYS

- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1.

- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.
- C. Grounding Screw: Provide green grounding screw in all outlet boxes.

2.6 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.7 ENCLOSURES AND CABINETS

- A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

- A. Outdoors: Use the following wiring methods:
 - 1. Exposed: Rigid steel.
 - 2. Concealed: Rigid steel.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Indoors: Use the following wiring methods:
 - 1. Exposed: EMT.
 - a. Use of EMT shall be restricted from locations where conduit is susceptible to severe corrosion or severe physical damage.
 - 2. Concealed: EMT.
 - 3. Within Concrete: Rigid steel.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
5. Damp or Wet Locations: Rigid steel conduit.
6. Corrosive Environments: Rigid steel conduit.
7. Exposed to Severe Physical Damage: Rigid steel conduit.
8. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.

3.3 INSTALLATION

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
- D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.
- G. Use temporary closures to prevent foreign matter from entering raceways.
- H. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- I. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- J. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- K. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- L. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
 1. Run parallel or banked raceways together, on common supports where practical.
 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- M. Couplings: Join raceways with fittings designed and approved for the purpose and make joints tight.
 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 2. Use insulating bushings to protect conductors.

3. Where raceway passes over a building expansion joint, a standard "expansion joint fitting" compatible with type of raceway shall be employed.
 4. EMT couplings shall be plated steel hexagonal compression type. EMT couplings shall be "concrete tight" where buried in masonry or concrete.
- N. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
1. Rigid steel conduit shall terminate in either a locknut/bushing set, or in a threaded hub.
 2. Where concentric, eccentric or over-sized knockouts are encountered, a grounding type insulated bushing shall be provided.
 3. EMT couplings shall be plated steel hexagonal compression type. EMT couplings shall be "concrete tight" where buried in masonry or concrete.
- O. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
- P. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- Q. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- R. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.
- S. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- T. Do not install aluminum conduits embedded in or in contact with concrete.
- U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

- V. All conduit installed on the interior of exterior walls be spaced off the interior wall surface a minimum of $\frac{1}{4}$ inch using clamp-backs or struts.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Direct-buried conduit, ducts, and duct accessories.
 - 2. Concrete-encased conduit, ducts, and duct accessories.
 - 3. Handholes and boxes.

1.3 DEFINITIONS

- A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include duct-bank materials, including separators and miscellaneous components.
 - 2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Include accessories for handholes and boxes.
 - 4. Include warning tape.
- B. Shop Drawings:
 - 1. Factory-Fabricated Handholes and Boxes:
 - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 FIELD CONDITIONS

- A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

- A. Comply with ANSI C2.

2.2 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cantex, Inc.
 - 2. Carlon
 - 3. CertainTeed Corp.; Pipe & Plastics Group.
 - 4. IPEX Inc.
 - 5. Lamson & Sessions; Carlon Electrical Products.
- B. Duct Accessories:
 - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
 - 2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Comply with ASTM C 858 for design and manufacturing processes.
- B. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
 - 1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - 2. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - 3. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.
 - a. Cover Hinges: Concealed, with hold-open ratchet assembly.
 - b. Cover Handle: Recessed.
 - 4. Frame and Cover: Weatherproof aluminum frame with hinged aluminum access door assembly with tamper-resistant, captive, cover-securing bolts.
 - a. Cover Hinges: Concealed, with hold-open ratchet assembly.
 - b. Cover Handle: Recessed.
 - 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 6. Cover Legend: Molded lettering, "ELECTRIC."
 - 7. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
 - 8. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - a. Extension shall provide increased depth of 12 inches
 - b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
 - 9. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
 - 10. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
 - a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - b. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
 - c. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

11. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.
12. Handholes: 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
 1. Color: Gray.
 2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC."
 6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
 7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.
- B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Engineer if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

- B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to handholes, and as approved by Engineer.
- C. Clear and grub vegetation to be removed, and protect vegetation to remain. Remove and stockpile topsoil for reapplication.

3.2 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- D. Underground Ducts Crossing Driveways and Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 EARTHWORK

- A. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- B. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- C. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.4 DUCT INSTALLATION

- A. Install ducts according to NEMA TCB 2.
- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches both horizontally and vertically, at other locations unless otherwise indicated.
- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

- E. Duct Entrances to Polymer Concrete Handholes: Use end bells, spaced proportionately for duct sizes.
 - 1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 - 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
 - 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- F. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition."
- G. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- H. Pulling Cord: Install 100-lbf test nylon cord in empty ducts.
- I. Concrete-Encased Ducts: Support ducts on duct separators.
 - 1. Excavate trench bottom to provide firm and uniform support for duct bank..
 - 2. Width: Excavate trench 12 inches wider than duct bank on each side.
 - 3. Width: Excavate trench 3 inches wider than duct bank on each side.
 - 4. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 - 5. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 - 6. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 7. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services.
 - 8. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

9. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 10. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 11. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
- J. Direct-Buried Duct Banks:
1. Excavate trench bottom to provide firm and uniform support for duct bank.
 2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
 4. Depth: Install top of duct bank at least 24 inches below finished grade unless otherwise indicated.
 5. Set elevation of bottom of duct bank below frost line.
 6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
 7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances.
 - a. Couple steel conduits to ducts with adapters designed for this purpose.
 - b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
 8. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.

3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Install handholes and boxes with bottom below frost line.
- D. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.6 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 - 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of handholes. Remove foreign material.

END OF SECTION 260543

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Warning labels and signs.
 - 5. Equipment identification labels.
 - 6. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,
- C. Material:
 - 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - 2. Overall Thickness: 5 mils.
 - 3. Foil Core Thickness: 0.35 mil.
 - 4. Weight: 28 lb/1000 sq. ft..
 - 5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.

2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Securely attached to equipment with self-tapping stainless steel screws; if the sharp end is protected, otherwise rivets shall be used. Minimum letter height shall be 1/2 inch. Nameplate material colors are as follows:
1. 240V/120V equipment – Blue Background with White Letters.

2.6 CABLE TIES

- A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- G. Cable Ties: For attaching tags. Use Plenum rated.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the circuit designation and system voltage.
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors at all accessible locations (power sources, junction or pull boxes and at utilization equipment terminations) use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG.
 - b. Contractor may use marking tape on neutral and grounding conductors #4 AWG and larger.
 - c. Colors for 208/120-V Circuits:
 - 1) Pole A: Black.
 - 2) Pole B: Red.
 - 3) Neutral: White
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using engraved labels.
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Identify system voltage with black letters on an orange background.
 - 2. Apply to exterior of door, cover, or other access.

- G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Recreational Vehicle Pedestals.

END OF SECTION 260553

SECTION 262416 – PANELBOARDS

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 panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.
- F. TVSS: Transient Voltage Surge Suppression.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

- C. Field Test Reports: Submit written test reports and include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- E. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

- A. Keys: Six (6) spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corp.; Cutler-Hammer Products.
 - b. Siemens Energy & Automation, Inc.
 - c. Square D, division of Schneider Electric.

2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- B. Panelboard cabinets shall be made of code gauge galvanized sheet steel, full flanged, be door in door type with continuous piano style exterior hinge, dead front type, and equipped with flush or surface type trim as required.
- C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- D. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- E. Bus: Hard-drawn copper, 98 percent conductivity.
- F. Main and Neutral Lugs: Mechanical type suitable for use with conductor material. Neutral bus shall be 100% rated.
- G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- H. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- I. Gutter Barrier: Arrange to isolate individual panel sections.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, power and feeder distribution type.
- B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- C. Mains: Circuit breaker, or Lugs only as identified on the drawings.
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits for circuit-breaker frame sizes 250 A and smaller.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings for circuit-breaker frame sizes above 250 A:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 - 4. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - 5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - b. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - c. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
 - d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mounting Heights: Top of trim 78 inches above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- E. Install filler plates in unused spaces.
- F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods".
- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant tamper-proof screws.

3.4 CONNECTIONS

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.
- B. The ground fault protection on the new circuit breakers shall be performance tested in the field and properly calibrated.

3.7 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

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 receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

- A. Product Data: For each product specified.
- B. Shop Drawings: Legends for receptacles and switch plates.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NEMA WD 1.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc.

- b. Eagle Electric Manufacturing Co., Inc.
- c. GE Company; GE Wiring Devices.
- d. Hubbell, Inc.; Wiring Devices Div.
- e. Killark Electric Manufacturing Co.
- f. Leviton Manufacturing Co., Inc.
- g. Pass & Seymour/Legrand; Wiring Devices Div.

2.2 RECEPTACLES

- A. Straight-Blade and Locking Receptacles: Commercial grade.
 - 1. NEMA 5-20R (standard #WDI.101968).
 - 2. Arranged for back and side wiring.
 - 3. Grounding type. Separate single or double grounding terminals with screw lugs and a direct, green insulated conductor connector to system ground. Screw shall be green and hex-headed.
 - 4. Listed by an approved third party agency.
- B. GFCI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch-deep outlet box without an adapter. Receptacles shall include automatic testing per UL requirements.
- C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

2.3 WALL PLATES

- A. Single and combination types match corresponding wiring devices.
 - 1. Plate-Securing Screws: Tamper proof metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.04-inch-thick, Type 302, satin-finished stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.4 FINISHES

- A. Color: Ivory, unless otherwise indicated or required by Code.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.

- C. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- D. Protect devices and assemblies during painting.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

- A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

3.5 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 262726

SECTION 311000 - 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. Removing existing vegetation.
 - 2. Clearing and grubbing (if needed).
 - 3. Stripping and stockpiling topsoil (if needed).
 - 4. Removing above- and below-grade site improvements.
 - 5. Disconnecting, capping or sealing, removing site utilities, and abandoning site utilities in place.
 - 6. Temporary erosion- and sedimentation-control measures.
- B. Related Sections:
 - 1. Division 01 Section "Temporary Facilities and Controls"
 - 2. Division 01 Section "Temporary Tree and Plant Protection"
 - 3. Division 01 Section "Execution"
 - 4. Division 01 Section "Construction Waste Management and Disposal"
 - 5. Division 31 Section "Erosion and Sedimentation Control"

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 containing at least 5 percent organic matter by weight; 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 non-soil materials.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated on plans.
- F. 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. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at the 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. Utility Locator Service: Notify "North Carolina OneCall (811)" for area where Project is located before site clearing.
- C. The Contractor shall be responsible for locating underground utilities prior to commencing work and / or excavation. If necessary, the construction manager may obtain the services of a commercial utilities locator and/or various utility companies who may have lines inside the area. In addition, Contractors shall contact the Owner's Representative at least five days prior to excavation. The Contractor will be responsible for utility interruptions caused by construction operations including excavations
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place and erosion control permit is obtained and posted at job-site.
- E. 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. Install temporary construction fencing per Section 01 "Temporary Facilities and Controls" and per Section 32 "Chain Link Fencing".
- C. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

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 the Cleveland County and NCDENR.
- 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 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 or abandoned in place.
 - 1. Coordinate with Owner prior to shutting off any utilities.
 - 2. Arrange with utility companies to shut off indicated utilities.
- 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 Owner, and Engineer not less than (72) hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.

3.4 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, and debris to a depth of 18 inches below exposed subgrade.

3. Chip removed tree branches and dispose of off-site.
- 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.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to a minimum depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
 1. Remove subsoil and non-soil 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. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
 3. Stockpile surplus topsoil to allow for re-spreading deeper topsoil

3.6 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 and concrete to remain before removing adjacent existing pavement or concrete. Saw-cut faces vertically.

3.7 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 non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. North Carolina Department of Transportation and Cleveland County Standard Specifications and Details where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
 - 2. Excavating and backfilling for structures.
 - 3. Subbase course for concrete walks and pavements.
 - 4. Subbase course and base course for asphalt paving.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
 - 3. Division 31 Section "Site Clearing" for site stripping, grubbing, stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 4. Division 31 Section "Erosion and Sedimentation Control".
 - 5. Division 33 Section "Storm Utility Drainage Piping".

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices and quantity allowances for earth moving specified in Division 01 Section "Unit Prices and Allowances."
- B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials for that condition.
 - 1. 24 inches outside of concrete forms other than at footings.
 - 2. 12 inches outside of concrete forms at footings.
 - 3. 6 inches outside of minimum required dimensions of concrete cast against grade.

4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches beneath bottom of concrete slabs-on-grade.
6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- F. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- G. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- H. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- I. Design Subgrade: Final subgrade elevation shown on site grading plan.
- J. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- K. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below design subgrade elevations or beyond indicated lines and dimensions as directed by Engineer or Owner's Testing Agency. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 3. Unauthorized Excavation: Excavation below design subgrade elevations or beyond indicated lines and dimensions without direction by Engineer or Owner's Testing Agency. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- L. Fill: Soil materials used to raise existing grades.
- M. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted Caterpillar 330 (or equivalent) using new rock teeth.
 2. Bulk Excavation: Late-model, Caterpillar D-8 (or equivalent) pulling a single-tooth ripper.

- N. 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.
- O. Reinforced Soil Fill: Soil materials specifically designed and compacted for use with Segmental Retaining walls designed by others.
- P. Structural Fill: Soil free of trash, refuse, frozen material, or other deleterious materials, and contains less than 3% organics. Shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings.
- Q. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- R. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geosynthetics.
 - 2. Lime and/or cement utilized for soil/base modification.
 - 3. ABC stone
 - 4. Detector warning tapes.
- B. Material Test Reports: For each off-site soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 698.
- C. Blasting plan approved by authorities having jurisdiction.
- D. Seismic survey report from seismic survey agency.
- E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
 - 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 - 2. Seismographic monitoring during blasting operations.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 2. Seismographic monitoring during blasting operations.
- C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
- D. Pre-excavation Conference: Conduct conference at the Project Site prior to commencement of site grading.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
1. Do not close or obstruct streets, parking lots, access drives, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving 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 Owner.
- C. Utility Locator Service: Notify "North Carolina OneCall (811)" for area where Project is located before beginning earth moving operations.
- D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 31 Sections "Site Clearing" and "Erosion and Sedimentation Control" are in place.
- E. Do not commence earth moving operations until a City of Raleigh Permit and NCDENR Erosion Control Plan Letter of Approval are obtained and posted at the project site.
- F. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.
- G. 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.
- H. Do not direct vehicle or equipment exhaust towards protection zones.

- I. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Unified Soil Classification System (USCS) Groups SM, SC, SW, SP, ML, and CL according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, greater than 3% organic material, and other deleterious matter; have a standard Proctor maximum dry density of at least 90 pounds per cubic foot (pcf). USCS groups CH and MH found at the project site can be used, provided the moisture content can be controlled, but should not be placed within 2 feet of final subgrade elevations.
 1. Compacted to not less than 95% of the Standard Proctor maximum below 12" and not less than 98% of the Standard Proctor maximum for the last 12".
- C. Unsatisfactory (or Unsuitable) Soils: Soils not meeting Satisfactory Soils as described in 2.1.B.
 1. On-site borrow materials with natural moisture contents at time of excavation below or up to 10 percent wet of the soil's optimum moisture content shall not be classified as unsatisfactory if the material otherwise meets the material requirements for satisfactory materials. The contractor shall wet or dry these materials to the acceptable moisture range, chemical dry, or replace with off-site borrow at no additional cost to the Owner
 2. On-site borrow materials with moisture contents more than 10 percent wet of the soil's optimum moisture content may be considered unsatisfactory. If unsatisfactory soils are found, a meeting with owner and owners testing agency will be required prior to hauling off material.-
- D. Base Course: Aggregate meeting the ABC stone requirements specified in section 1005-3 and 1005-4 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures, January 2012.
- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Structural Fill: Same as Satisfactory Soils.
- G. Reinforced Soil Fill: ASTM D 2487; GW, GP, SW, SP, and SM soil classification groups or a combination of these groups; free of debris, waste, frozen materials, vegetation, and other deleterious matter; contain less than 0.5% organics and pH value between 3 and 9; meeting the following gradation according to ASTM C 136: 100 percent passing 2-inch sieve, 20 to 100 percent passing No. 4 (4.75-mm) sieve, 0 to 60 percent passing No. 40 (0.425-mm) sieve, 0 to 25 percent passing No. 200 (0.075-mm) sieve, and with fine fraction having a plasticity index of less than 20. Shall have a minimum effective friction

angle of 30 degrees when compacted to at least 95% of its standard Proctor maximum dry density at a moisture content of +/-3% of its optimum moisture.

- H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. 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 sieve and 0 to 5 percent passing a No. 8 sieve.
- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Sand: ASTM C 33; fine aggregate.
- L. Low Permeability Fill: ASTM D 2487; CL, CH, and MH soil classification groups or a combination of these groups; free of debris, waste, frozen materials, vegetation, and other deleterious matter. Shall have a maximum dimension of 3 inches.

2.2 GEOTEXTILES

- A. Subsurface Drainage / Separation Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Grab Tensile Strength: 205 lb; ASTM D 4632.
 - 2. Grab Tensile Elongation: 50%; ASTM D 4632.
 - 3. Trapezoidal Tear Strength: 80 lb; ASTM D 4533.
 - 4. CBR Puncture Strength: 500 lb; ASTM D 6241.
 - 5. Apparent Opening Size: No. 80 sieve, maximum; ASTM D 4751.
 - 6. Permittivity: 0.2 per second, minimum; ASTM D 4491.
 - 7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Stabilization Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Grab Tensile Strength: 247 lbf; ASTM D 4632.
 - 2. Sewn Seam Strength: 222 lbf; ASTM D 4632.
 - 3. Tear Strength: 90 lbf; ASTM D 4533.
 - 4. Puncture Strength: 90 lbf; ASTM D 4833.
 - 5. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 - 6. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 - 7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- C. Detectable Tracer Wire: In accordance with NC General Statute 87-121 (g), [Wake-Cleveland County](#) requires a #12 solid bare copper wire is to be installed with gravity sewer mains and services, storm drainage systems, reuse mains and services, and any nonmetallic water service tubing. It is not required for DIP water mains or copper water services.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Follow Construction Sequence provided on Drawings.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- C. Protect and maintain erosion and sedimentation controls during earth moving operations.
- D. Remove from site, material encountered in grading operations that does not meet the definition of Satisfactory Soils (2.1.B). Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein. Materials encountered within the top 18 inches of existing site elevations (prior to stripping) are the responsibility of the Contractor at no additional cost to the Owner (i.e. allowances only apply to depths below top 18 inches of existing site elevations, prior to stripping).
- E. Prior to placing fill in low areas, such as previously existing creeks, or ponds, perform following procedures:

1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
 2. After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed. Materials encountered within the top 18 inches of existing site elevations (prior to stripping) are the responsibility of the Contractor at no additional cost to the Owner (i.e. allowances only apply to depths below top 18 inches of existing site elevations, prior to stripping).
 3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not within 5'-0" of perimeter of paving or retaining wall subgrade. If, after observation, material is found to be unsatisfactory, it shall be removed from site.
- F. After topsoil stripping, notify Owner's Testing Agency. Proof-roll exposed subgrades in fill areas with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or frozen subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer or Owner's Testing Agency, and replace with compacted backfill or fill as directed. Materials encountered within the top 18 inches of existing site elevations (prior to stripping) are the responsibility of the Contractor at no additional cost to the Owner (i.e. allowances only apply to depths below top 18 inches of existing site elevations, prior to stripping).
- G. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Design:
1. Designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.
 2. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.
 3. Contractor shall be responsible for the design, installation, operation, maintenance, and any failure of any component of the system.
- B. Damages:
1. Contractor shall be responsible for an shall repair any damage to work in place, other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation. Contractor responsibility shall also include, damage to the bottom due to heave and including but not limited to, removal and pumping out of

the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

2. Remove subgrade materials rendered unsatisfactory by excessive wetting and replace with approved backfill material at no additional cost to the Owner.
- C. Maintaining Excavation in Dewatering Condition
1. Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will be permitted.
 2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
 3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the vent any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
 4. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.
- D. System Removal: Upon completion of the work, remove dewatering equipment from the site, including related temporary electrical service.
- E. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped and abandoned in accordance with regulations by agencies having jurisdiction.

3.3 EXPLOSIVES

- A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
1. Perform blasting without damaging adjacent structures, property, or site improvements.
 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least- practicable disturbance to rock to remain

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to design subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include pavements, underground structures, utilities, obstructions, and other items indicated to be removed; together with soil, boulders, and rock. No changes in the

Contract Sum or the Contract Time will be authorized for rock excavation, removal of obstructions, or unsuitable soils to subgrade elevation.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory materials. Contractor will be paid for disposal and replacement of unsatisfactory materials encountered at depths greater than 18 inches below the existing ground surface elevation, prior to stripping.
 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings. 12 inches outside of concrete forms at footings.
 - b. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - c. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - d. 6 inches beneath bottom of concrete slabs-on-grade subbase materials.
 - e. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.
- B. Unsatisfactory Soils: Volume of soils not meeting the definition of Satisfactory Soils (2.1.B), or determined by the Owner's Testing Agency to be unstable or unsuitable for subgrade support, measured in original position, and replaced with satisfactory structural fill/subgrade/foundation material that meets the allowable design bearing pressure, compaction requirements, and settlement limitations specified in the geotechnical report and construction documents for the site and structure. Unsatisfactory soils shall not be removed until approved and cross-sectioned by Owner's Testing Agency. Changes in the Contract Sum or the Contract Time will be in accordance with Allowances and Unit Prices provisions for removal and replacement of unsuitable soils. No changes in the Contract Sum or the Contract Time if unsatisfactory materials are encountered within 18 inches below the existing ground surface elevation, prior to stripping.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

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. 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.
 1. Clearance: 6 inches 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 in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation, removal of obstructions, or unsuitable soils to trench bottom.
- E. Trenches in Tree- and Plant-Protection Zones:
 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.8 SUBGRADE EVALUATION

- A. Notify Owner's Testing Agency when excavations have reached required subgrade.
- B. If Owner's Testing Agency determines that Unsatisfactory Soils (3.4.B) are present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof- roll wet or frozen subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer or Owner's Testing Agency, and replace with compacted backfill or fill as directed.
- D. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation, removal of obstructions, or Unsatisfactory soils to subgrade elevation.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Testing Agency, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations as directed by Owner's Testing Agency.

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.
 - 2. Place silt fence approximately 3-ft from edge of stockpile.
 - 3. 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. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil.
- D. Trenches under Roadways: After installing and testing piping or conduit less than 30 inches below surface of roadways, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- E. Backfill voids with satisfactory soil compacted in accordance with specifications provided herein while removing shoring and bracing.
- F. Place and compact initial backfill of subbase material and satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. All underground piping and utilities (both metallic and non-metallic), except lawn irrigation lines, shall have two stages of identification and/or warning by a combination of non-detectable and detectable warning tapes.
- I. Install warning tape (detectable warning tape) directly on top of the pipeline and permanently secured to the pipeline at 10' intervals.
- J. Install identification tape (non-detectable warning tape) approximately 18" to 30" above the service pipe, but a minimum of 10" and a maximum of 24" below finished grade.
- K. Install tracer wire to bottom of pipe taped at a maximum of 10' intervals. An insulated copper tracer wire or other approved conductor shall be installed along the length of the pipe to all nonmetallic piping, including irrigation lines, and metallic pipe with compression gasket fittings installed underground. Access shall be provided to the tracer wire or the tracer wire shall terminate aboveground at the end of the nonmetallic piping. The tracer wire size shall be copper single-conductor 10AWG minimum and the insulation type suitable for direct burial with type "UF" (Underground Feeder) insulation and shall be continuous along the pipeline passing through the inside of each valve box or manhole.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

- B. Place and compact fill material in layers using satisfactory fill (or structural fill) to required elevations.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. On-site borrow materials with natural moisture contents below or up to 10 percent wet of the soil's optimum moisture content shall not be classified as unsatisfactory if the material otherwise meets the material requirements for satisfactory materials. The contractor shall wet or dry these materials to the acceptable moisture range, chemical dry, or replace with off-site borrow at no additional cost to the Owner.
 - 3. On-site borrow materials with moisture content more than 10 percent wet of the soil's optimum moisture content may be considered unsatisfactory.
 - 4. 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

- B. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- C. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- D. Compact as follows:

Location	Percent of Maximum Laboratory Density ASTM D698
Subgrade and Fill below Structures and Pavement (top 12 inches)	98
Subgrade and Fill below Structures and Pavement (below top 12 inches)	95
Subgrade & Fill in All other Areas	90

3.16 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.

- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.

3.17 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
 - 2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.18 BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades approved by the Owner's Testing Agency free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 - 1. Place base course material over subgrade under hot-mix asphalt pavement.
 - 2. Shape base course to required crown elevations and cross-slope grades.
 - 3. Place base course 10 inches or less in compacted thickness in a single layer.
 - 4. Place base course that exceeds 10 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 4 inches thick.
 - 5. Compact base course at moisture content within +/- 2% of optimum moisture to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to AASHTO T-180 as modified by NCDOT.
- C. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each base layer to not less than 98 percent of maximum dry unit weight according to AASHTO T-180 as modified by NCDOT.

3.19 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a Testing Agency to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material and maximum lift thickness comply with requirements.
 - 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
 - 4. Full-time observation and testing for retaining walls.
- B. Owner's Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections. This includes, but is not limited to:
- C. Allow testing agency to evaluate and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved: At subgrade and at each compacted fill and backfill layer, at least one test for every 2500 sq. ft. or less of paved area, but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- D. Maintain subgrades to receive base course stone within compaction and moisture requirements continuously until stone is placed.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Transport surplus satisfactory soil and topsoil to designated storage areas on Owner's property or remove from site and legally dispose as directed by Engineer. Stockpile or spread soil as directed by Engineer.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312317 – TRENCHING

PART 1 GENERAL

1.1 GENERAL NOTES

- A. Prior to beginning work, Contractor to request a field inspection with the Owner and Engineer for inspection before project start and before project acceptance.
- B. Trenches for underground piping, where necessary shall be excavated to the required depth and bell holes shall be provided where necessary to insure uniform bearing. Trench excavation lines shall provide sufficient clearance for proper execution of underground work.
- C. Trenches shall be open cut from the surface. Irregularities at bottom of trench, or where excavation is below required depth shall be refilled to required grade with compacted soil, or flowable fill at direction of onsite geotechnical engineer.
- D. The Contractor shall be held responsible for the sufficiency of sheeting and bracing and for all damages to property or injury to persons resulting from improper quality, strength, placing and maintenance of trench shoring, sheeting or bracing.
- E. Existing utility lines to be retained that are shown on construction drawings or locations of which are made known to the Contractor prior to excavation operations, shall be protected from damage during excavation and backfilling, and if damaged shall be repaired by Contractor, at own expense.
- F. Existing utility lines found during excavations that were not shown on construction drawings or made known to Contractor prior to excavation shall be protected and remain uninterrupted until approval by Owner or Engineer to proceed.
- G. The Contractor shall be responsible for providing and maintaining a pedestrian and traffic control plan in accordance with Owner standards.
- H. All underground utilities encountered during the projects construction shall be located by a Professional Land Surveyor licensed in North Carolina.

1.2 DEFINITIONS

- A. Standard Specifications: When referenced in this section, shall mean North Carolina Department of Transportation Road and Bridge Specifications, January 2018. Parts of these Standard Specifications that are specifically referenced shall become part of this section as though stated herein in full. In case of a discrepancy between the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.3 SUMMARY

- A. Section Includes:
 - 1. Excavating trenches for utilities from 5 feet outside any building to terminating connection.
 - 2. Compacted fill from top of utility bedding to finished grade.
 - 3. Backfilling and compaction.
- B. Related sections:
 - 1. Section 260500 – “General Electrical”

2. Section 312000 – “Earth Moving”
3. Section 312919 – “Dewatering”
4. Section 312500 – “Erosion and Sedimentation Control”

1.4 SUBMITTALS

- A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.
- B. Product Data: Geotextile fabric indicating fabric and construction.
- C. Materials Source: Name of imported fill materials suppliers.

1.5 QUALITY ASSURANCE

- A. Perform Work according to NCDOT and Cleveland County standards.
- B. Prepare excavation protection plan under direct supervision of professional engineer experienced in design of this Work and licensed in State of North Carolina.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.7 COORDINATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Subsoil Fill: Type as specified in Standard Specifications.
- B. Structural Fill: Type as specified in Standard Specifications.
- C. Granular Fill: Type as specified in Standard Specifications.
- D. Concrete:
 1. Lean concrete.

2.2 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven. Use NCDOT standard for fabric application and type by use.

PART 3 EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated.
 1. Engineer may make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

- B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

- A. Call local utility line information service at 811 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- D. Protect bench marks, existing structures, trees, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of work.

3.3 TRENCHING

- A. Excavate subsoil required for utilities.
- B. Remove lumped subsoil, boulders, and rock over 6 inches.
- C. Perform excavation within 24 inches of existing utility service according to utility's requirements.
- D. Do not advance open trench more than 200 feet ahead of installed pipe.
- E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work, dewater in accordance with Section 31 23 19.
- F. Excavate bottom of trenches to a maximum of 2 feet past outside diameter dimensions or outside of concrete cradle.
- G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.
- H. When Project conditions permit, slope side walls of excavation starting 24 inches above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this Section.
- I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by onsite Owner's Testing Agency until suitable material is encountered.
- J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with flowable fill or Owner's Testing Agency approved fill and compact to density equal to or greater than requirements for subsequent backfill material.
- K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- L. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.
- M. Remove excess subsoil not intended for reuse, from Site.
- N. Stockpile excavated material in area designated on Site according to Section 31 25 00.

3.4 SHEETING AND SHORING

- A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

- B. Support trenches excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation or at direction of onsite geotechnical engineer.
- C. Design sheeting and shoring to be removed at completion of excavation Work.
- D. Repair damage caused by failure of sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

- A. Backfill trenches to contours and elevations with Satisfactory Soils per Section 312000.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Place fill material in continuous layers and compact to 95 percent of the material's standard Proctor maximum dry density (ASTM D698), except in the top 12 inches where this shall be increased to 98 percent.
- D. Protect open trench to protect the public.

3.6 FIELD QUALITY CONTROL (to be provided by Owner's Testing Agency)

- A. Perform laboratory material tests according to ASTM D1557.
- B. Perform in place compaction tests according to following:
 - 1. Density Tests: ASTM D1556.
 - 2. Moisture Tests: ASTM D3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- D. Test as required in Section 31200, "Field Quality Control".

3.7 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 312317

SECTION 312319 – DEWATERING

PART 1 GENERAL

1.1 GENERAL NOTES

- A. Excavations should be kept dry at all times by means of cofferdams, trenches, sumps, pumps or other equipment or arrangements required and approved.
- B. Prevent surface water from flowing into excavations, ponding on prepared subgrades and from flooding Project site and surroundings.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation and/or subsurface seepage.
- D. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations or trenches. Establish and maintain temporary drainage ditches and other diversions outside excavation limits as required and approved by Owner or Engineer.
- E. Do not use excavations or trenches as temporary drainage ditches.

1.2 SUMMARY

- A. Section Includes:
 - 1. Construction site dewatering.
- B. Related sections:
 - 1. Section 312500 - "Erosion and Sedimentation Control"

1.3 DEFINITIONS

- A. Dewatering includes the following:
 - 1. Removing surface or ground water from within excavations or trenches.
 - 2. Disposing of removed water.
- B. Surface Water Control: Removal of surface water within open excavations.

1.4 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, including comprehensive engineering analysis by a qualified professional engineer, 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.

1.5 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to dewatering including, but not limited to, the following:
 - a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
 - b. Proposed site clearing and excavations.

1.6 PROJECT CONDITIONS

- A. Survey Work: Engage a qualified land surveyor to survey adjacent structures and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if any damage is evident in adjacent construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION

- A. Conduct additional borings and investigations to supplement subsurface investigations identified as required to complete dewatering system design.
- B. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 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.
- 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 Section 31 25 00 during dewatering operations.

3.3 INSTALLATION

- A. Contractor shall furnish, install, operate, and maintain any pumping equipment, etc. needed for removal of water from various parts of the site at no additional cost to the Owner.
- B. Work shall be in accordance with NCDOT standards.

3.4 FIELD QUALITY CONTROL

- A. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

END OF SECTION 312319

SECTION 312324 - FLOWABLE FILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Flowable fill for:
 - a. Structure backfill.
 - b. Utility bedding.
 - c. Utility backfill.
 - d. Filling abandoned utilities.
 - e. Concrete Cradle.

1.2 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, manhole, tank, or cable.
- B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required such as fill for utility trenches, bridge abutments, and culverts.
- C. Non-excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated such as fill below structure foundations and filling abandoned utilities.

1.3 SUBMITTALS

- A. Materials Source: Name of flowable fill materials suppliers.
- B. Mix Design:
 - 1. Furnish flowable fill mix design for each specified strength. Furnish separate mix designs when admixtures are required for following:
 - a. Flowable fill Work during hot and cold weather.
 - b. Air entrained flowable fill Work.
 - 2. Identify design mix ingredients, proportions, properties, admixtures, and tests.
 - 3. Furnish test results to certify flowable fill mix design properties meet or exceed specified requirements.
- C. Delivery Tickets:
 - 1. Furnish duplicate delivery tickets indicating actual materials delivered to Project Site.

1.4 QUALITY ASSURANCE

- A. Perform Work according to State of North Carolina Department of Transportation standards.
- B. Manufacturer: Company specializing in manufacturing products specified in this Section with three years' experience.
 - 1. Product source approved by authority having jurisdiction.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

PART 2 PRODUCTS

2.1 FLOWABLE FILL

- A. Furnish materials according to State of North Carolina Department of Transportation standards.
- B. Flowable Fill: Excavatable type.
- C. Flowable Fill for Stormwater Control Measure cradle: Non-Excavatable Type; 750 psi minimum

2.2 MATERIALS

- A. Portland Cement: ASTM C150 Type I - Normal.
- B. Fine Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2.3 ADMIXTURES

- A. Furnish materials according to State of North Carolina Department of Transportation standards.

2.4 MIXES

- A. Mix and deliver flowable fill according to ASTM C94/C94M, Option C.
- B. Flowable Fill Design Mix:

ITEM	EXCAVATABLE	NON-EXCAVATABLE
Cement Content	75 to 100 lb/cu yd	100 to 150 lb/cu yd
Fly Ash Content	None	150 to 600 pcf
Water Content	As specified	As specified
Air Entrainment	5-35 percent	5-15 percent
28-Day Compressive Strength	Maximum 100 psi	Minimum 125 psi (750 psi for stormwater control measure cradle)
Unit Mass (Wet)	80 to 110 pcf	100 to 125 pcf
Temperature, Minimum at Point of Delivery	50 degrees F	50 degrees F

- C. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.
- D. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.5 SOURCE QUALITY CONTROL

- A. Test and analyze properties of flowable fill design mix and certify results for following:
 - 1. Properties of hardened flowable fill design mix including:
 - a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
 - b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.
- B. Prepare delivery tickets containing following information:
 - 1. Project designation.
 - 2. Date.
 - 3. Time.
 - 4. Class and quantity of flowable fill.
 - 5. Actual batch proportions.
 - 6. Free moisture content of aggregate.
 - 7. Quantity of water withheld.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify excavation is complete.
- B. Verify utility installation is complete and tested before placing flowable fill.
- C. Verify excavation is dry and dewatering system is operating, if required.

3.2 PREPARATION

- A. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.
- B. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.
- C. Protect utilities to prevent intrusion of flowable fill.

3.3 INSTALLATION - FILL, BEDDING, AND BACKFILL

- A. Place flowable fill by chute, pumping or other methods approved by Engineer.
 - 1. When required, place flowable fill under water using tremie procedure.
 - 2. Do not place flowable fill through flowing water.
- B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.
- C. Place flowable fill evenly on both sides of utilities to maintain alignment.
- D. Place flowable fill to elevations indicated without vibration or other means of compaction.

3.4 INSTALLATION - FILLING ABANDONED UTILITIES

- A. Perform work in accordance with Standard Specifications and Construction Drawings.

- B. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.
- C. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.
- D. Place flowable fill using method to ensure there are no voids.
 - 1. Fill pipes and conduits from high end.
 - 2. Fill manholes, tanks, and other structures from grade level access points.
- E. After filling pipes and conduits seal both ends.

3.5 FIELD QUALITY CONTROL (to be provided by Owner's Testing Agency)

- A. Perform testing according to ASTM C94/C94M.
 - 1. Take samples for tests for every 150 cu yd of flowable fill, or fraction thereof, installed each day.
 - 2. Sample, prepare and test four compressive strength test cylinders according to ASTM D4832. Test one specimen at 3 days, one at 7 days, and two at 28 days.
 - 3. Measure temperature at point of delivery when samples are prepared.
- B. Defective Flowable Fill: Fill failing to meet following test requirements or fill delivered without following documentation.
 - 1. Test Requirements:
 - a. Minimum temperature at point of delivery.
 - b. Compressive strength requirements for each type of fill.
 - 2. Documentation: Duplicate delivery tickets.

3.6 CLEANING

- A. Remove spilled and excess flowable fill from Project Site.
- B. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION 312324

SECTION 312500 - EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers work necessary for stabilization of soil to prevent erosion during and after construction and land disturbance activities. The work shall include furnishing all labor, materials, tools, and equipment to perform all work and services necessary for or incidental to the furnishing and installation, complete, of all operations in connection with erosion control as shown on drawings and as specified, in accordance with provisions of the Contract Documents, and completely coordinated with work of all other trades. The Contractor shall insure that all sedimentation features are in place prior to construction as necessary. Contractor shall remove the features as ground cover is established with approval of the Engineer and/or controlling authorities.
- B. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. The right is reserved to modify the use, location, and quantities of soil erosion and sedimentation control measures based on activities of the Contractor and as the Engineer considers to be the best interest of the Owner.
- C. Any governmental agency standard as noted below should be referenced as the latest, most recent, or current version of the referenced standard.
- D. The Contractor shall implement the approved Erosion and Sediment Control plan and follow all state requirements regarding sedimentation and erosion control. Construction methods shall minimize sedimentation and erosion.
- E. See additional information noted on the Drawings.

1.2 DEFINITIONS

- A. NCDOT: North Carolina Department of Transportation
- B. NCDEQ - DEMLR: North Carolina Department of Environmental Quality - Division of Energy, Mineral, and Land Resources.
- C. Standard Erosion Control Specification: North Carolina Erosion and Sediment Control Planning and Design Manual, latest version. Available at the following location: <http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/erosion-sediment-control-planning-design-manual>

1.3 GENERAL

- A. See Division 01, "General Requirements," which contain information and requirements that apply to the Work specified herein and are mandatory for this project.

- B. All activities shall conform to the Standard Erosion Control Specification: North Carolina Erosion and Sediment Control Planning and Design Manual, latest version; the approved erosion control permit; the Specifications; and the Drawings. In the event of a conflict, the more stringent requirement shall apply.
- C. The Sections of the Standard Erosion Control Specifications referenced include, but are not limited to:

Standard & Specification No	Title
6.10	Temporary Seeding
6.51	Hardware Cloth and Gravel Inlet Protection
6.62	Sediment Fence (Silt Fence)
6.66	Compost Sock

- D. Soil erosion stabilization and sedimentation control shall consist of the following elements:
 - 1. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary
 - 2. Construction of temporary erosion control facilities such as silt fences, inlet protection, etc.
 - 3. Topsoil, Temporary Seeding, and Sod:
 - a. Placement and maintenance of Temporary Seeding on all areas disturbed by construction, as necessary
 - b. Placement of permanent topsoil, fertilizer, and sod, etc. in areas as specified on the Drawings.
 - 4. It is the intent that all areas in which construction activities have disturbed existing vegetation shall be temporarily seeded, as required, topsoiled, and permanently sodded.
- E. The Contractor shall be responsible for phasing Work in areas allocated for his / her exclusive use during this Project, including any proposed stockpile areas, to restrict sediment transport. This will include installation of any temporary erosion control devices, ditches, or other facilities that may be required to comply with NCDEQ regulations and requirements.
- F. The areas set aside for the Contractor's use during the Project may be temporarily developed to provide satisfactory working, staging, and administrative areas for his / her exclusive use. Preparation of these areas shall be in accordance with other requirements contained within these Specifications and shall be done in a manner to both control all sediment transport from the project area, and to permit the area to be returned to design grades and drainage patterns upon completion of the project.

- G. Upon completion of the Project, all areas that have been disturbed by the Contractor shall be stabilized by top-soiling and permanent sodding.
- H. All permanent stockpiles, if any, shall be seeded with soil stabilization seed and protected by construction of two (2) rows of silt fence.
- I. Sediment transport and erosion from working stockpiles shall be controlled and restricted from moving beyond the immediate stockpile area by construction of temporary silt fence, as necessary. The Contractor shall keep these temporary facilities in operational condition by regular cleaning, re-grading, and maintenance.
- J. The Contractor shall maintain all elements of the Soil Erosion Stabilization and Sedimentation Control systems to be constructed during this Project for the duration of his / her activities on this Project. Formal inspections made jointly by the Contractor and the Engineer shall be conducted every week to evaluate the Contractor's conformance to the requirements of both these Specifications and NCDEQ regulations.
- K. Maintenance of the Soil Erosion Stabilization and Sedimentation Control systems constructed as part of this project shall be in accordance with the Drawings and NCDEQ Standard Erosion Control Specifications.

1.4 SUBMITTALS

- A. Submittals shall be made in accordance with the Specifications, Section 013300, "Submittal Procedures."
- B. In addition, the Contractor shall provide the following specific information:
 - 1. If Contractor plans to vary erosion control phasing from the Drawings, then he / she shall submit a written plan, including definition and locations of phased erosion and sediment control for areas that will be disturbed during staged construction sequences. This information shall be provided to the Engineer and Owner, for review, before commencing any Work on the Project.

1.5 QUALITY ASSURANCE

- A. Perform Work according to NCDEQ-DEMLR standards.

1.6 INSPECTIONS AND RECORD KEEPING

- A. The Contractor is responsible for self-inspection of sedimentation and erosion control devices throughout the life of the Work, including preparation of self-inspection reports and NPDES Self-Monitoring Reports, to make sure the approved erosion and sedimentation control plan is being followed. To simplify documentation of Self-Inspection Reports and NPDES Self-Monitoring Reports, Contractor shall use a combined form available at <http://deq.nc.gov/about/divisions/energy-mineral-land-resources/erosion-sediment-control/forms>

- B. Contractor shall refer to Self-Inspection Reports Reporting Requirements on Drawings.

PART 2 PRODUCTS

2.1 AGGREGATE

A. Silt Fence Outlet

- 1. Furnish according to Standard Erosion Control Specification

2.2 GEOTEXTILES

A. Sediment Fence Geotextile

- 1. Furnish according to Standard Erosion Control Specification

2.3 SEDIMENT FENCE STEEL POSTS

A. Furnish according to Standard Erosion Control Specification

2.4 SEDIMENT FENCE FABRIC REINFORCEMENT

A. Furnish according to Standard Erosion Control Specification

2.5 COIR FIBER WATTLE

A. Coir Fiber Wattle shall meet the following specifications:

- 1. 100% Coir (Coconut) Fibers
- 2. Minimum Diameter 12 in.
- 3. Minimum Density 3.5 lb/ft³ +/- 10%
- 4. Net Material Coir Fiber
- 5. Net Openings 2 in. x 2 in.
- 6. Net Strength 90 lbs.
- 7. Minimum Weight 2.6 lbs./ft. +/- 10%

2.6 PLANTING MATERIALS

A. Temporary Seeding and Soil Supplements:

- 1. Furnish according to Standard Erosion Control Specification

- B. Permanent Seeding (if used)
 - 1. Furnish according to Standard Erosion Control Specification
- C. Sod (if used)
 - 1. Furnish according to Owner requirements matching the existing natural turf within the project area

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall install erosion and sediment control measures and maintain in accordance with the Drawings, the sequence of construction shown on the Drawings are made a part of these Contract Documents.
- B. The Contractor shall install any additional measures which the Engineer or Inspector may deem necessary to comply with the Standard Erosion Control Specification general criteria or NCDEQ Erosion Control requirements, at no additional cost to the Owner.
- C. The Contractor shall provide and maintain Temporary Seeding at all times.

3.2 SILT FENCE

- A. Silt fence to be installed as indicated on Drawings and per the Standard Erosion Control Specification. Silt fence to be placed prior to demolition, trench installations, or other clearing activities. Silt fence may be temporarily removed and replaced to facilitate construction.
- B. Maintenance shall be performed per the Standard Erosion Control Specification.
- C. After ground cover has been established and approved by Engineer and NCDEQ Erosion Control Inspector, the silt fence shall be removed and disposed of in an approved off-site location at the Contractor's expense.

3.3 SILT FENCE OUTLETS

- A. Install silt fence outlets per the details shown on Drawings and per the Standard Erosion Control Specification.
- B. Maintenance shall be performed per the Standard Erosion Control Specification.
- C. Contractor to verify silt fence outlet placement at low points as they exist or develop. Additional silt fence outlets may be required to prevent erosion during and after construction and land disturbance activities. If additional silt fence outlets are necessary, Contractor to add additional silt fence outlets per Engineer, NCDEQ Erosion Control Inspector, or Owner direction at no additional cost to the Owner.

3.4 INLET PROTECTION

- A. Install Inlet Protection per the detail shown on Drawings and per the Standard Erosion Control Specification.
- B. Inlet protection shall be placed at the upstream side of any pipe or structure discharging outside of the disturbed limits. See Drawings for location.

3.5 GROUND STABILIZATION

- A. Contractor shall provide ground stabilization per the Standard Erosion Control Specification and in accordance with the table below

B.

Site Area Description	Stabilization Time Frame	Stabilization Time Frame Exceptions
Perimeter Dikes, Swales, Ditches, and Slope	7 Days	None
High Quality Water (HQW) Zones	7 Days	None
Slopes Steeper Than 3:1	7 Days	If Slopes are 10' or less in length and are not steeper than 2:1, 14 Days
Slopes 3:1 or Flatter	14 Days	7-Days for slopes greater than 50-ft in length
All other areas with slopes flatter than 4:1	14 Days	None (except for perimeters and HQW zones)

3.6 TEMPORARY SEEDING

- A. Temporary Seeding is to be placed and maintained over all disturbed areas prior to Permanent Sodding per the detail shown on Drawings and per the Standard Erosion Control Specification
- B. Maintain Temporary Seeding until such time as areas are approved for permanent seeding. As a minimum, maintenance shall include the following:
 1. Fix-up and reseeded of bare areas or re-disturbed areas.
 2. Mowing for stands of grass or weeds exceeding 6 inches in height.

END OF SECTION 312500

SECTION 321216 - 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 paving.
 - 2. Hot-mix asphalt paving overlay.
 - 3. Asphalt surface treatments.
 - 4. Pavement-marking paint.
- B. Related Sections:
 - 1. Division 31, Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 and Standard Specifications of North Carolina Department of Transportation (NCDOT) 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. Shop Drawings: Indicate pavement markings and lane separations.
- 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 NCDOT.
- B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.
- C. Testing Agency Qualifications: Qualified according to ASTM D 3666 and NCDOT for testing indicated.

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- D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the NCDOT Standard Specifications (latest version) and the Cleveland County for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
 - E. Pre-installation 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.
 - F. Contractor shall provide and conduct a quality control program as defined as all activities, including mix design, process control inspection, sampling and testing, and necessary adjustments in the process that are related to the production of the pavement in accordance with NCDOT's "Hot Mix Asphalt Quality Management System" (HMA / QMS) manual which is in force on the date of the contract advertisement.

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.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if base is frozen, wet or excessively damp, if rain is imminent or expected before time required for adequate cure, in accordance with Table 610-3 from the NCDOT Standard Specifications.
- B. Pavement-Marking: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate, Fine Aggregate, and Mineral Filler

1. In accordance with the requirements of Section 520 NCDOT Standard Specifications and the Drawings.

2.2 ASPHALT MATERIALS

- A. All materials utilized in the production of hot mix asphalt shall meet NCDOT applicable requirements of the provisions from Section 610 titled "Asphalt Concrete Plant Mix Pavement," for the type of Superpave plant mix pavement specified on the Drawings.

2.3 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by NCDOT; 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. Initial Course: Types I-19.0B and S-9.5B.
 2. Surface Course: Types SF-9.5A and S-9.5B.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that base course is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with a loaded, tandem-axel dump truck making repeated passes over the subject area to identify soft pockets and areas that rut, pump or deflect excessively. Proof-rolling shall be observed and areas repaired as recommended by Owner's Testing Agency prior to paving. Do not proof-roll wet or saturated base course.
 1. Completely proof-roll base course in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 3. Excavate soft spots, unsatisfactory stone and/or soils, and areas of excessive pumping or rutting, as determined by Owner's Testing Agency, and replace with compacted ABC stone or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected and verified by Owner's Testing Agency.

3.2 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared base course is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared surface of compacted-aggregate base before applying paving materials.

- C. Tack Coat: Apply uniformly to surfaces of existing pavement and abutting concrete surfaces at a rate of 0.05 to 0.15 gal./sq. yd.
 - 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.

3.3 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off in accordance with NCDOT requirements. 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 per Drawings.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- 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.

3.4 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.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 - 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.

3.5 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.
- 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 laydown and rolling operations to comply with requirements.

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- 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 as follows:
 - 1. Target Average Density (S-9.5B, I-19.0B): 92 percent of theoretical maximum density according to AASHTO T166, T275, or T331, with no individual test less than 90 percent nor greater than 100 percent.
 - 2. Target Average Density (SF-9.5A): 90 percent of theoretical maximum density according to AASHTO T166, T275, or T331, with no individual test less than 88 percent nor greater than 98 percent.
 - 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. Cutting and patching of newly placed asphalt is unacceptable. If defective asphalt is discovered, milling of asphalt and replacement with new asphalt will be required.
 - 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.

3.6 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Initial Course: Plus or minus 1/2 inch or per NCDOT requirements, whichever is more stringent.
 - 2. Surface Course: Plus 1/4 inch, no minus or per NCDOT requirements, whichever is more stringent.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Initial Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 PAVEMENT MARKING

- A. Apply temporary traffic 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 three minutes.

B. Permanent Pavement Markings – Thermoplastic Composition shall be placed in accordance with NCDOT specifications.

1. Thermoplastic Alkyd/Maleic and Hydrocarbon pavement markings shall be composed of the following materials:

COMPONENT BY WEIGHT

Alkyd/Maleic Binder.....	18.0%	Min.
Hydrocarbon Binder.....	22.0%	Min.
Glass Beads (Premixed).....	30.0%	Min.
Titanium Dioxide (ASTM D-476, Type 2).....	10.0%	Min.
Yellow Pigment (For Yellow Marking Only)	4.0%	Min.

2. Calcium carbonate and inert fillers shall be opted by the manufacturer, providing all other specifications are met.
3. The total silica content used in the formulation of the thermoplastic shall be the premixed glass beads.
4. The pigment, beads, and filler shall be uniformly dispersed in the binder.
5. The Alkyd/Maleic binder shall consist of a mixture of synthetic resins (at least one synthetic resin shall be solid at room temperature) and high boiling point plasticizers. At least one-third of the binder composition shall be 100% maleic-modified glycerol ester of resin and shall be no less than 10% by weight of the entire material formulation. The binder shall contain no petroleum Hydrocarbon resins, tall oil resins or rosins, or any combination of tall oil resins with maleic- modified glycerol esters of rosin.
6. The Hydrocarbon binder shall consist of a mixture of Hydrocarbon resins (at least one Hydrocarbon resin shall be solid at room temperature) and high boiling point plasticizers.
7. The thermoplastic material shall be free of contaminants and shall be dry blended or hot mixed from 100% virgin stock using no reprocessed materials.
8. The thermoplastic material shall be formulated such that when it is on the roadway surface at any natural temperature it exists in a hard, solid state with cold ductility that permits normal movement with the road surface without chipping or cracking.
9. The thermoplastic material shall not deteriorate or discolor when held at the application temperature for periods of time up to 4 hours or upon repeated reheating (a minimum of 4 times).
10. The color, viscosity, and chemical properties versus temperature characteristics of the thermoplastic material shall remain constant for up to 4 hours at the application temperature and shall be the same from batch to batch.
11. The thermoplastic material shall be readily applicable at temperatures between 400 & 440 degrees F from the approved equipment to produce lines and symbols of the required above the pavement thickness.

3.8 FIELD QUALITY CONTROL

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- A. Contractor is responsible for quality control in accordance with NCDOT's "Hot Mix Asphalt Quality Management System" (HMA/QMS) manual including, but not limited to thickness, smoothness, and in-place density.
 - B. Contractor is responsible for providing Owner's Testing Agency with theoretical daily moving average from plant for each day's placement and each mix type placed during that day.
 - C. Testing Agency: Owner's Testing Agency will core a minimum of three locations for each day's placement per mix type. The cores will be evaluated by the Owner's Testing Agency for thickness and compaction.
 - D. Contractor to replace and compact hot-mix asphalt where core tests were taken.
 - E. Remove and replace hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 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 321216

SECTION 321313 - CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Curbs and gutters.
 - 2. Walks.
- B. Related Sections:
 - 1. Division 3, Section, "Cast-in-Place Concrete"
 - 2. Division 31, Section, "Earth Moving"

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product info: Data, Test Reports, and Material Certifications for each type of product indicated as required in Division 3.
- B. Furnish drawings indicating jointing pattern proposed for all areas of concrete pavement for approval by the Engineer. Only information completely checked by the manufacturer and the General Contractor will be considered by the Engineer.

1.5 QUALITY ASSURANCE

- A. Products and methods of execution are specified by reference to North Carolina State Department of Transportation and Highway Safety's "Standard Specifications for Roads and Structure" (latest edition). The abbreviation NCDOT is used to designate this publication. Equivalent alternate products and methods of execution as defined by the specifications. All methods and substitutions must be approved by the Engineer.
- B. Testing: The Owner's Testing Agency will evaluate concrete delivered to and placed at the site in accordance with requirements of Division 3.
- C. Pre-installation Conference: Conduct conference at the Project Site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete paving subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces. Forms shall remain in place for a minimum of 24 hours after concrete placement or until concrete is secure. Use straight forms, free of distortion and defects, extending the full depth of concrete. All forms shall receive a form coating the full depth of concrete per Division 3 of these specifications prior to placing concrete.
 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
- C. Automatic Machine Curb and Gutter
 1. Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, Contractor shall submit revised mix design and laboratory test results which meet or exceed minimums specified.
 2. Machine placement must produce curb and gutters to required cross-section, line grades, finish, and jointing as specified for formed concrete. If results are not acceptable, Contractor shall remove and replace with formed concrete as specified.

2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of preconsumer recycled content is not

less than 25 percent.

- B. Plain-Steel Welded Wire Reinforcement: ASTM A-185, fabricated from steel wire into flat sheets.
- C. Tie Bars: ASTM A 615, Grade 60, deformed.
- D. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- F. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

- A. Concrete: Concrete and equipment, workmanship and materials for forming shall conform to applicable requirements of Division 3, unless otherwise specified. Concrete shall be standard weight with minimum compressive strength as specified on the construction drawings for the various applications.

2.4 CURING MATERIALS

- A. Curing Compound shall be:
 - a. "Clear Bond" by Guardian Chemical Company
 - b. "Sealkure" by Toch Brothers, Inc.
 - c. "Klearseal" by Penn-Dixie or equivalent

2.5 RELATED MATERIALS

- A. Expansion Joint Fillers: Expansion joint fillers shall be ½ inch thick unless otherwise shown on Drawings, equivalent to and shall conform to NCDOT Section 1028:
 - 1. Celotex "Flexcell", "Fibre", by W.R. Meadows
 - 2. "Tex-Lite", by K & P Petroleum Products
 - 3. Sonneborn Sonolastic Sealant
- B. Joint Sealer: Silicone sealant as manufactured by Surebond Inc., WR Meadows, Dow Corning, Silka Corporation or equivalent.

2.6 DETECTABLE WARNING MATERIALS

- A. In accordance with Cleveland County standards and details.

2.7 CONCRETE MIXTURES

- A. Concrete mixture shall conform to applicable requirements of Division 3.
- B. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with Owner requirements.

2.8 CONCRETE MIXING

- A. Concrete mixing shall conform to applicable requirements of Division 3.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Engineer or Owner's Testing Agency.

3.2 PREPARATION

- A. Remove loose material from compacted base or subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Butt Joints: Use a bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 2 inches into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where

indicated.

1. Locate ½ inch expansion joints at intervals of 30 feet unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than ½ inch or more than 1 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. For concrete walks provide contraction joints at 5'-0" (max) o.c., unless otherwise shown on Drawings. For curb and gutter, joints shall be in accordance with the Drawing detail. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing. Curbs shall be true, straight, and of uniform level and slope. All construction shall conform to NCDOT Section 846 and applicable requirements therein. The concrete shall be given a light broom finish with brush marks parallel to the curb line or gutter line.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
- L. Cold-Weather Placement: Refer to Division 3 Section "Cast in Place Concrete"
- M. Hot-Weather Placement: Refer to Division 3 Section "Cast in Place Concrete"
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations. Finishing operations shall conform to the requirement of NCDOT Section 710.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or

windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Immediately after finishing operations, cure exposed concrete surfaces in accordance with NCDOT Section 700.
- F. After curing, remove debris and backfill area adjoining sidewalk and paving. Grade and compact to conform to surrounding area in accordance with lines and grades indicated on Drawings. Remove damaged concrete that does not drain properly and reconstruct at no additional cost to Owner.

3.9 FIELD QUALITY CONTROL

- A. Sampling: See Division 3, Section "Cast-in-Place Concrete" for testing requirements.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer.
- B. Drill test cores where directed by Engineer or Owner's Testing Agency, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive. See Division 3, Section "Cast-In-Place Concrete" for testing requirements.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding: See Construction Documents for limits of seeding.
2. Related Sections:
 - a. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
 - b. Division 31 Section "Earth Moving" for excavation, filling, backfilling, and rough grading.
 - c. Division 31 Section "Erosion and Sedimentation Control" for other devices.

1.2 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. 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.
- E. 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.
- F. Planting Area: Areas to be planted.
- G. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- I. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

1.3 SCOPE

- A. Contractor is to provide and install topsoil, provide soil preparation and provide and install turf and grass areas.
- B. Contractor is to scarify subgrade in coordination with and prior to installation of any imported topsoil in order to mix the soil profiles.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of grass seed.
 - 1. Certification of each permanent seed mixture for hydroseed areas.
- C. Product certificates.
- D. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- E. 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.

1.5 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.
 - 1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

1.6 MAINTENANCE SERVICE

- A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3.7. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: Through date of building acceptance by Owner.
 - a. When initial maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Initial Permanent Hydroseed Seed Mix Maintenance Service: Provide full maintenance by skilled employees. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable seed mix areas are established, but for not less than the following periods:
 - 1. Permanent Seed Mix Areas: One year from installation.
 - a. When initial maintenance period has not elapsed before end of planting season, or if seed mix areas are not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; screened and free of stones 2 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled off-site. Verify suitability of stockpiled surface soil to produce topsoil. Screen surface soil to remove roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient, or quality is not acceptable for vigorous and healthy growth of plant material.
 - b. If imported topsoil is required, the subgrade shall be scarified or tilled to a depth of at least 6" prior to installation of imported topsoil. Following installation of imported topsoil, the topsoil shall be tilled to integrate the soil profiles.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, 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 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m.
- B. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.4 FERTILIZER

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium. Depending on soil analysis select one of the following compositions:
1. 18-16-12.
 2. 24-6-12.

2.5 MULCHES

- A. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- B. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.6 PLANTING SOIL MIX

- A. Planting Soil Mix: Topsoil mixed with the soil amendments and fertilizers in the quantities per the results of the topsoil analysis.

PART 3 - EXECUTION

3.1 TOPSOIL INSTALLATION

- A. Contractor is responsible for installation of topsoil and incorporating soil amendments and fertilizers in the quantities per results of the topsoil analysis. Scarify and loosen subgrade to integrate imported topsoil with subgrade. Install 4" of topsoil at the following locations:
1. Lawn Areas
 2. Parking Lot Islands
 3. Slope Areas

3.2 LAWN PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Unchanged Subgrades: If lawns are 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 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 3. Remove stones larger than 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.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.3 HYDROSEED AREA PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Unchanged Subgrades: If lawns or hydroseeded areas are 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 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 3. Remove stones larger than 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.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared hydroseed areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.4 HYDROSEEDING

- A. Contractor is responsible for hydroseeding permanent seed mix areas.
- B. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
- C. Sow seed at a total rate of .7 lb/1000 sq. ft. (30 lbs./acre). Confirm quantity with supplier.
- D. Permanent Hydroseed mix to grow to 2'-0" to 3'-0" and, once established, require mowing at 6" to 8" one to two times per year. The Hydroseed mix is to consist of the following:
 - 1. Virginia Wild Rye Elymus Virginicus 14%
 - 2. Switch Grass 'Carthage' Panicum virgatum 'Carthage' 5%
 - 3. Little Bluestem Schizachyrum scoparium 55%
 - 4. Indian Grass Sorghastrum nutans 20%
 - 5. Slender Indian Grass Sorghastrum elliotii 3%
 - 6. Purple Lovegrass Eragrostis spectabilis 3%
- E. 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 two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than 300 lb/acre. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.
 - 3. Install Jute mesh or other biodegradable slope stabilizer at slopes.
- F. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a depth of 3/16 inch and roll surface smooth.

3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 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. Sow seed at a total rate indicated on plans.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 per erosion control plans.
- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of [2 tons/acre] to form a continuous blanket [1-1/2 inches]

in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 2. Bond straw mulch by spraying with asphalt emulsion at a rate of [10 to 13 gal./1000 sq. ft.]. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas from hot, dry weather or drying winds by applying [compost mulch] [peat mulch] [planting soil] within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of [3/16 inch], and roll surface smooth.

3.6 PLUGGING

- A. Plant plugs in holes or furrows, spaced 24 inches apart in both directions. On slopes, contour furrows to near level.

3.7 LAWN MAINTENANCE

- A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations until date of building acceptance by Owner. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.
- B. Mow lawn 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.
- C. Mow and maintain until owner acceptance.

3.8 HYDROSEED AREA MAINTENANCE

- A. Maintain and establish hydroseed areas by watering, weeding, mowing, trimming, replanting, and other operations until seed mix areas are established. Typical establishment period is 2-3 years. Provide materials and installation the same as those used in the original installation. Mow only per manufacturer's recommendations to eliminate weeds and to optimize plant health.
- B. Maintain per manufacturer's recommendations.

3.9 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with total grass coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches, with at least 60% of the total grass coverage consisting of Fescue.
- B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.10 SATISFACTORY HYDROSEED MIX AREAS

- A. Satisfactory hydroseed mix areas: At end of maintenance period, a healthy, uniform, close stand of the nurse crop has been established, free of weeds and surface irregularities, with coverage exceeding 80 percent over any 10 sq. ft. area and bare spots not exceeding 5 by 5 inches. Present evidence of native seed germination to the designer for review and approval.
- B. Use specified materials to reestablish seed mix areas that do not comply with requirements and continue maintenance until seed mix areas are satisfactory.

END OF SECTION 329200

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 GENERAL NOTES

- A. All storm drainage structures, related piping and accessories shall be in accordance with the State of North Carolina Department of Transportation standards and supplemented with any applicable Cleveland County standards. If discrepancies exist, they should be brought to the Engineer's attention immediately.
- B. Refer to construction drawings for number, location and details of all proposed structures and pipes.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Materials, Installation, and Testing shall be in accordance with NCDOT and Cleveland County standards and specifications.

1.3 SUMMARY

- A. Section includes but not limited to the following items and appurtenances shown on drawings and specified in this Section:
 - 1. Pipe and fittings.
 - 2. inlets and outlets.

1.4 DEFINITIONS

- A. RCP: Reinforced Concrete Pipe.
- B. HDPE: High Density Polyethylene
- C. NCDOT: North Carolina Department of Transportation.

1.5 SUBMITTALS

- A. Product Data: Manufacturer information describing part, accessories, connections and any standard details.
- B. Manufacturer's Instructions: Special procedures required to install specified products.
- C. Shop Drawings: Indicate Part Sizes, connection sizes, elevations and connection parts.
- D. Manufacturer's Certificate: Products meet or exceed specified requirements.
- E. Qualifications Statements:
 - 1. Qualifications for manufacturer, and installer.
 - 2. Manufacturer's approval of installer.
- F. Field quality-control reports.
- G. Project Record Documents: Record actual locations of catch basins, drop inlets, yard inlets and grate/rim and invert elevations.
- H. Operation and Maintenance Data: Submit any special requirements for maintenance.

1.6 QUALITY ASSURANCE

- A. Perform Work according to State of North Carolina Department of Transportation and the Cleveland County standards.
- B. Fabricator: Company specializing in fabricating products specified in this Section with three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Store according to manufacturer's instructions.
- C. Protect any UV sensitive materials from sunlight by using manufacturer recommendations.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner's Representative no fewer than (72) hours in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Owner's Representative's written permission
- B. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Pipe and Fittings: ASTM C 76. Pipe and special fittings installed with 10 feet or less cover over top of pipe shall be Class III, and all other pipe and special fittings shall be Class IV. Basis of acceptance of reinforced concrete pipe shall be the 0.01" crack.
 - 1. Bell-and-spigot ends and sealant joints with ASTM C 990, bitumen or butyl-rubber sealant.

2.2 PIPE OUTLETS

- A. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-3, screen opening 2 inches.
 - 2. Average Size: NSSGA No. R-4, screen opening 3 inches.
 - 3. Average Size: NSSGA No. R-5, screen opening 5 inches.
- B. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- C. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are per NCDOT Standard Specifications.

3.2 EXAMINATION

- A. Verify that excavations, dimensions and elevations are as indicated.
- B. Check pipes for cracks or other compromising features.
 - 1. Any irregularities shall be reported and approved prior to installation.

3.3 PREPARATION

- A. Correct over-excavation with coarse aggregate.
- B. Prepare base in accordance with applicable NCDOT standard.

3.4 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Laser Equipment: Contractor shall utilize laser equipment to insure that piping is installed at elevations and slopes indicated on plans.
- G. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping at invert elevations as specified in the storm drainage table.
 - 3. Install nonreinforced-concrete piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 4. Install reinforced-concrete piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.5 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 - 1. Join reinforced-concrete piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

3.6 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.7 CONNECTIONS

- A. Make connections to existing underground manholes.
 - 1. Make branch connections from side into underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 48 inches below final grade. Fill to within 12 inches of top with stone or gravel. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.9 IDENTIFICATION

- A. Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use identification tape or non-detectable warning tape over all underground lines outside building footprint in the backfill approximately 18" to 30" above the service pipe, but a minimum of 10" and a maximum of 24" below finished grade.
 - 2. Use detectable warning tape over ferrous and nonferrous piping and over edges of underground manholes. Tape all underground lines outside building footprint directly on top of the pipeline and permanently secured to the pipeline at 10' intervals.
 - 3. Use insulated copper tracer wire or other approved conductor installed adjacent to underground nonmetallic piping and metallic pipe with compression gasket fittings installed underground. Access shall be provided to the tracer wire or the tracer wire shall terminate aboveground at the end of the nonmetallic piping. The tracer wire size shall not be less than 10AWG and the insulation type suitable for direct burial. The tracer wire size shall be copper single-conductor 10AWG minimum and the insulation type suitable for direct burial with type "UF" (Underground Feeder) insulation and shall be continuous along the pipeline passing through the inside of each valve box or manhole.

3.10 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Re-inspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

- a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
- b. Option: Test concrete piping according to ASTM C 924. C. Leaks and loss in test pressure constitute defects that must be repaired.
- c. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.11 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

FORM OF PROPOSAL

Foothills Public Shooting Complex Expansion

Skeet and Trap Expansion

Skeet and Trap/ Additional Alternates

Bidder: _____

Date: _____

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

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

Cleveland County

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

Foothills Public Shooting Complex Expansion – Skeet and Trap Expansion

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

Cleveland County, and The John R. McAdams Company, Inc.

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT:

Base Bid: _____ Dollars(\$)

Paving Subcontractor:
_____ Lic _____

Utility Subcontractor:
_____ Lic _____

Grading Subcontractor:
_____ Lic _____

Electrical Subcontractor:
_____ Lic _____

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

ALTERNATES:

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

GENERAL CONTRACT:

Alternate No. G-1: Site work for offsite gravel parking lot off Fielding Road (as shown in plan set Foothills Shooting Complex Improvements – Skeet and Trap Expansion, sheets C-7, C-8 and C-9).

(Add) _____ Dollars(\$)

Alternate No. G-2: Paving the main parking lot (as shown in plan set Foothills Shooting Complex Improvements – Skeet and Trap Expansion).

(Add) _____ Dollars(\$)

Alternate No. G-3: Electrical installation beyond the proposed pad mounted transformer, serving the various range locations, as shown on sheet E.100.

(Add) _____ Dollars(\$)

UNIT PRICES

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

GENERAL CONTRACT:

No. 1: Additional excavation of material as requested by the Owner, which will include hauling and placement on the County landfill property.

Unit Price (\$) _____ per 100 Cubic Yards

No. 2: Cost of material and placement of geotextile stabilization fabric (i.e. Mirafi 500x or equivalent) or geogrid (i.e. BX-1100 or equivalent).

Unit Price (\$) _____ per Square Yard

No. 3: Removal of Mass/Bulk Rock, as approved by Owner’s Testing Agency, and offsite disposal.

Unit Price (\$) _____ per Cubic Yard

No. 4: Removal of Trench Rock, as approved by Owner’s Testing Agency, and offsite disposal.

Unit Price (\$) _____ per Cubic Yard

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the General

Requirements SECTION 012500. Applicable liquidated damages amount is also stated in the General Requirements SECTION 012500.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

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

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

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

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

*** OR ***

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

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

Proposal Signature Page

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

Respectfully submitted this day of _____

(Name of firm or corporation making bid)

WITNESS:

(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or type

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

Address _____

ATTEST:

By: _____

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

License No. _____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 6 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7 _____

Identification of HUB Certified/ Minority Business Participation

I, _____
 (Name of Bidder)

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

Firm Name, Address and Phone #

Work Type

*Minority Category

**HUB Certified (Y/N)

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

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

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

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

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

County of _____

(Name of Bidder)

Affidavit of _____

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

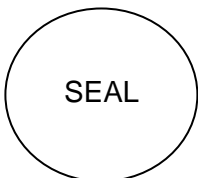
Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

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

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

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

Date: _____ Name of Authorized Officer: _____
Signature: _____
Title: _____



State of _____, County of _____
Subscribed and sworn to before me this _____ day of _____ 20____
Notary Public _____
My commission expires _____

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

County of _____

Affidavit of _____

(Name of Bidder)

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

_____ contract.

(Name of Project)

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

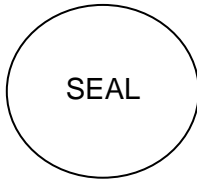
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

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

Notary Public _____

My commission expires _____

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

County of _____

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

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
 This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

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

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

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

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

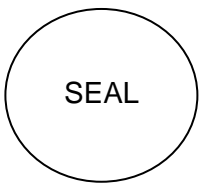
*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

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

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

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

Date: _____ Name of Authorized Officer: _____



Signature: _____

Title: _____

State of _____, County of _____
 Subscribed and sworn to before me this _____ day of _____ 20____
 Notary Public _____
 My commission expires _____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

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

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

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

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

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

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

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

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

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

- 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.

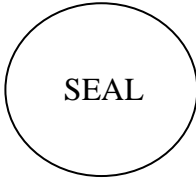
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

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

Notary Public _____

My commission expires _____

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

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

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

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

Date: _____ Approved/Certified By: _____

Name

_____ Title

_____ Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

SECTION 0001740 – WARRANTIES AND BONDS

Part 1 - General

1.1 Summary

- A. Contractor shall submit to Architect before final payment, three (3) copies of all warranties, guarantees, certificate of bills paid, release of liens and surety bonds on the work, as required under his Contract. All such documents shall show name of Project, Location, and Name of Owner.
- B. The Contractor shall guarantee the work for one (1) year after acceptance of same unless stipulated otherwise for individual portions of the building or any portion thereof be guaranteed for less than one (1) year after acceptance. Provide letter stating such for this particular project on Contractor letterhead.
- C. The Contractor shall furnish a letter to Owners certifying that materials used in the work contained no lead or asbestos.

1.2 Bid Security:

- A. Each Bid shall be accompanied by a cash deposit, a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a Bid Bond executed by a Surety Company licensed under the laws of N.C. to execute such bonds. The amount of such bid security shall be equal to 5% of the bid.
- B. Bid security shall be retained by Owner as liquidated damages in event of failure of successful bidder to execute Contract within ten (10) days after award or to give satisfactory surety as required by law (General Statutes of N.C., C.143, Art. 8, S.129).
- C. Bid Bond, if submitted as security, shall be conditioned that the Surety will upon demand forthwith make payment to the obligee upon said bond if the Bidder fails to execute the Contract in accordance with the Bid Bond, and upon failure to forthwith make payment, that the Surety shall pay to the obligee an amount equal to said Bond.

1.3 Performance and Payment Bond:

- A. An AIA Performance and Payment Bond will be required in an amount equal to one hundred percent (100%) of the Contract Price. Bond shall be delivered to the Architect within ten (10) days after the notice of acceptance of Proposal. FORM OF PERFORMANCE BOND for this project will be AIA Document A311.

END OF SECTION 0001740

SECTION 0001800 – CONTRACT FORM

Part 1 - General

1.1 Summary

- A. Form of contract for this project will be the standard form of agreement between owner and contractor (where the basis of payment is a stipulated sum), latest edition, AIA document of the American Institute of Architects. The form of contract may be reviewed in the office of the architect or may be obtained from the American Institute of Architects, 1735 New York Avenue, NW, Washington, D.C. 20006.

END OF SECTION 0001800