



**EARLY JOYNER DRIVE /**  
**INFRASTRUCTURE PACKAGE BID**  
**DOCUMENTS FOR MOORE BUILDING**

# Project Manual

SCO Project #22-24697-01B

JPA Project #20WCU777



## Bid Documents

January 29, 2024

**Jenkins • Peer Architects**



SUD ASSOCIATES, P.A.  
CONSULTING ENGINEERS






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## I - Designer Seals

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<p><b><u>Sud Associates:</u></b>          Michael Saenger          (Mechanical)</p> <p>Jerome Hay          (Plumbing &amp; Fire          Protection)</p> <p>Donald Burdette          (Electrical)</p>	 <p>01.29.2024</p>
<p><b><u>Civil Design Concepts,</u></b>  <b><u>PA:</u></b>          Patrick Brashaw          (Civil)</p> <p>Greg Hoffman          (Civil)</p>	 <p>01/29/2024</p>

## II - PROJECT TEAM

### ARCHITECT OF RECORD:

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## III - DRAWING LIST

### SHEET INDEX

#### **GENERAL**

G-001B COVER SHEET

#### **CIVIL**

C-101B EXISTING CONDITIONS & DEMO PLAN

C-201B ROADWAY PLAN & PROFILE

C-301B ROUGH GRADING & EROSION CONTROL PLAN PHASE I

C-302B ROUGH GRADING & EROSION CONTROL PLAN PHASE II

C-303B ROUGH GRADING & EROSION CONTROL PLAN PHASE III

C401B FINE GRADING PLAN

C-501B STORM PLAN & PROFILE

C-601B UTILITY PLAN

C-801B CONSTRUCTION STAGING PLAN

C-921B SITE DETAILS

C-922B SITE DETAILS

C-923B SITE DETAILS

C-931B EROSION CONTROL DETAILS

C-951B STORM DETAILS

C-952B STORM DETAILS

C-961B WATER DETAILS

C-998B NCG01

#### **ELECTRICAL**

E-100B ELECTRICAL - GENERAL & DETAILS

E-101B ELECTRICAL – SITE LIGHTING

E-102B ELECTRICAL - SITE LIGHTING PHOTOMETRICS

ED101B ELECTRICAL – SITE DEMOLITION

## IV - PROJECT APPROACH NARRATIVE

### PROJECT DESCRIPTION

WCU – Upper Campus Infrastructure Repair and Replacement: Joyner Drive Improvements  
Design Development Civil / Site Narrative

#### **Demolition and Phasing**

The existing project area consists of widening and realigning Joyner Dr so that the road intersects with Central Dr at Buzzards Roost Rd for a future signalized intersection. The demolition and construction will be phased so that emergency vehicle access is maintained.

Demolition for the Joyner Drive will involve removal of existing asphalt, concrete curb and gutter and sidewalk as well as an existing asphalt parking lot. Existing underground utilities remain in place with the exception of relocating one existing waterline.

#### **Clearing / Grading / Erosion Control**

The existing project area consists of Joyner Drive, sidewalk, one parking lot, and retaining walls throughout the site. The proposed realignment will include new sidewalk as well as tying in existing sidewalks and intersecting driveways and roadways.

Traditional erosion control measures consist of silt fence, inlet protections and temporary seeding. No construction entrance is proposed because the existing Joyner Drive driveway is to remain and to be utilized as the entrance to the site during demolition and construction. These measures will be used to minimize any potential for a loss of sedimentation from the project site during the duration of the project construction.

#### **Stormwater Systems**

An existing paved ditch runs along the south side of Central Drive between the edge of pavement and the existing wall. A proposed storm drain system is to be installed underneath the existing travel lane of Central Drive with the existing ditch to be filled in as a NCDOT 30" curb and gutter.

Surface run-off from the project will be collected via a storm drain network (curb inlets and conveyance pipes). The proposed storm drain network will tie directly into the proposed storm drain to be installed in Central Drive. All proposed structures shall meet NCDOT standards. The conveyance pipes should be in the range of 18" - 24" in diameter. These pipes shall also meet applicable NCDOT and AASHTO standards for roadway improvements.

Cullowhee is not a Phase 2 community. As such, there is no stormwater management (quality of quantity) proposed to be installed with this project.

#### **Utility Relocation / Abandonment**

One existing water line is located underneath the proposed Joyner Drive.

One sanitary sewer crossing has been abandoned in placed by WCU, it will be removed where it is necessary due to the lowering of the intersection of Joyner and Circle Drive.

All other utilities are to remain in place. New lighting will be added along the reconfigured street and pedestrian path.

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

**STANDARD FORM FOR CONSTRUCTION PROJECTS**

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

**Form OC-15**

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

**Twenty Fourth Edition January 2013**



## **INSTRUCTIONS TO BIDDERS**

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

### **1. PROPOSALS**

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

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

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

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

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

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

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

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

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

## **2. EXAMINATION OF CONDITIONS**

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

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

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

## **3. BULLETINS AND ADDENDA**

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

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

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

#### **4. BID SECURITY**

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

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

#### **5. RECEIPT OF BIDS**

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

#### **6. OPENING OF BIDS**

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

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

## **7. BID EVALUATION**

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

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

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

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

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

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

## **8. PERFORMANCE BOND**

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

## **9. PAYMENT BOND**

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

## **10. PAYMENTS**

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

## **11. PRE-BID CONFERENCE**

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

## **12. SUBSTITUTIONS**

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

Submittals for proposed substitutions shall include the following information:

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

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

## GENERAL CONDITIONS OF THE CONTRACT

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

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## ARTICLE 1 - DEFINITIONS

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



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

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

## ARTICLE 2 - INTENT AND EXECUTION OF DOCUMENTS

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

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

### **ARTICLE 3 - CLARIFICATIONS AND DETAIL DRAWINGS**

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

### **ARTICLE 4 - COPIES OF DRAWINGS AND SPECIFICATIONS**

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

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

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

#### **ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA**

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

#### **ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE**

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

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

## **ARTICLE 7 - OWNERSHIP OF DRAWINGS AND SPECIFICATIONS**

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

## **ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES**

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

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

## **ARTICLE 9 - ROYALTIES, LICENSES AND PATENTS**

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

## **ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS**

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

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

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

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

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

## **ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973**

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

## **ARTICLE 13 - INSPECTION OF THE WORK**

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



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

#### **ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE**

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

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

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

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

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

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

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

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

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

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

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

## **ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS**

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

## **ARTICLE 16 - SUBCONTRACTS AND SUBCONTRACTORS**

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

## **ARTICLE 17 - CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS**

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

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

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

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

## **ARTICLE 18 - DESIGNER'S STATUS**

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

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

## **ARTICLE 19 - CHANGES IN THE WORK**

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

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

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

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



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

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

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

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

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

## **ARTICLE 20 - CLAIMS FOR EXTRA COST**

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

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

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

## **ARTICLE 21 - MINOR CHANGES IN THE WORK**

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

## **ARTICLE 22 - UNCORRECTED FAULTY WORK**

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

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

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

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

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

#### **ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY**

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

#### **ARTICLE 25 - FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT**

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

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

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

## **ARTICLE 26 - CORRECTION OF WORK BEFORE FINAL PAYMENT**

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

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

#### **ARTICLE 27 - CORRECTION OF WORK AFTER FINAL PAYMENT**

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

#### **ARTICLE 28 - OWNER'S RIGHT TO DO WORK**

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

#### **ARTICLE 29 - ANNULMENT OF CONTRACT**

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

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

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

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

#### **ARTICLE 31 - REQUEST FOR PAYMENT**

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



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

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

## **ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT**

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

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

### **ARTICLE 33 - PAYMENTS WITHHELD**

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

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

## **ARTICLE 34 - MINIMUM INSURANCE REQUIREMENTS**

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

### **a. Worker's Compensation and Employer's Liability**

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

### **b. Public Liability and Property Damage**

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

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

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

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

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

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

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

**d. Deductible**

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

**e. Other Insurance**

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

**f. Proof of Carriage**

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

**ARTICLE 35 - PERFORMANCE BOND AND PAYMENT BOND**

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

**ARTICLE 36 - CONTRACTOR'S AFFIDAVIT**

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

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

#### **ARTICLE 37 - ASSIGNMENTS**

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

#### **ARTICLE 38 - USE OF PREMISES**

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

#### **ARTICLE 39 - CUTTING, PATCHING AND DIGGING**

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

#### **ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS**

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

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

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

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

#### **ARTICLE 41 - CLEANING UP**

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

#### **ARTICLE 42 - GUARANTEE**

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

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

#### **ARTICLE 43 - CODES AND STANDARDS**

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

#### **ARTICLE 44 - INDEMNIFICATION**

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

#### **ARTICLE 45 - TAXES**

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

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



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

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

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

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

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

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

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

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

#### **ARTICLE 46 - EQUAL OPPORTUNITY CLAUSE**

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

#### **ARTICLE 47 - EMPLOYMENT OF INDIVIDUALS WITH DISABILITIES**

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

#### **ARTICLE 48 - ASBESTOS-CONTAINING MATERIALS (ACM)**

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

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

#### **ARTICLE 49 - MINORITY BUSINESS PARTICIPATION**

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

#### **ARTICLE 50 – CONTRACTOR EVALUATION**

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

#### **ARTICLE 51 – GIFTS**

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

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

#### **ARTICLE 52 – AUDITING-ACCESS TO PERSONS AND RECORDS**

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

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

## **ARTICLE 53 – NORTH CAROLINA FALSE CLAIMS ACT**

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

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

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

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

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

## **ARTICLE 54 – TERMINATION FOR CONVENIENCE**

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

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

**SUPPLEMENTARY GENERAL CONDITIONS  
OF THE CONTRACT**

**STANDARD FORM FOR CONSTRUCTION CONTRACTS**

**WESTERN CAROLINA UNIVERSITY**

## **SUPPLEMENTARY GENERAL CONDITIONS (SGC's) OF THE CONTRACT**

This document supplements but does not alter in any way the requirements of the General Conditions of the Contract.

### **ARTICLE 1 - DEFINITIONS**

As defined in Article 1 of the General Conditions, the Supplementary General Conditions as well as the WCU General Requirements are considered part of the contract documents.

The Owner is the State of North Carolina through Western Carolina University.

Provide shall mean purchase, deliver, install, new, clean, completely operational, fully tested and ready for use.

### **ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA**

The submittal requirements are described in Article 5 of the General Conditions. Items for which submittals are required are listed below:

#### **Pre-Submittals:**

- The contractor shall provide the Owner a complete list of contact information for the Contractor, his key personnel, and all Subcontractors. This list shall be provided to the Owner prior to beginning the Work and shall be updated regularly with the updated provided to the Owner.
- All items referenced in Technical Specifications

#### **Post-Submittals:**

- All previously submitted documents revised to show as-built condition.
- O&M Manuals for any equipment requiring a submittal.

Data on the following items shall be sent to the Designer for review and approval. The submittal process is described in Article 5 of the General Terms and Conditions. Refer to "Technical Specifications" for required submittals. All Pre-Submittals shall be delivered to the Designer and Owner no later than the Preconstruction Meeting. All Post Submittals shall be delivered to the Designer and Owner within thirty (30) days of work completion. The final pay request shall be included with Post-Submittals.

The Contractor shall submit with initial approval of the design documents for compliance and accuracy, electronic copies in PDF format of all shop drawings and submittals. Physical samples shall be submitted for color and workmanship (mock-up) approval.

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

### **ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE**

The Contractor shall maintain at the job site (job site office) a readable set of the complete set of working drawings and specifications for his work, including all shop drawings. The Contractor shall maintain at the job site an up-to-date, readable set of the As-Built drawings.

#### **ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES**

Should an accident or disruption occur on the project work site, the Contractor shall notify the WCU Project Manager and WCU Safety and Risk Management Office as soon as possible and no less than 24 hours of occurrence.

The Contractor and Subcontractors shall be responsible for security to their equipment and the site-stored materials under their jurisdiction, whether paid for by the Owner or not, until acceptance of the project. The Contractor shall coordinate security requirements with the WCU Project Manager.

The Contractor shall maintain daily field reports by its field supervision listing, but not limited to, personnel onsite (including all subcontractors), weather conditions, major scopes of work under construction, material deliveries, safety incidents, progress photographs, and inspections. The Contractor shall submit a copy of the daily field reports to the Designer and Owner upon request and at project completion

#### **ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS**

The Contractor shall request and obtain permission from the WCU Project Manager for an interruption of utility or services a minimum of seven (7) days in advance. Failure of the Contractor to obtain Owner permission shall not be grounds for an extension of time.

Prior to performing any “hot work” or any work above ceiling in existing buildings, the Contractor shall obtain a permit for such from the WCU Safety and Risk Management Office.

The Contractor shall comply with Owner’s Interim Life Safety Plan requirements to maintain egress from all occupied buildings.

#### **ARTICLE 14 - CONSTRUCTION SUPERVISION and SCHEDULE**

The Contractor shall start work within two (2) weeks upon receipt of Notice to Proceed. The Contractor shall submit a project work schedule before beginning work. The starting date and work schedule shall be adhered to, and the work shall be performed during the Owner’s normal working hours, 8:00 AM to 5:00 PM. Requests by the Contractor to work outside normal working hours shall be made a minimum of one (1) week in advance to the WCU Project Manager on site. The Contractor’s bid shall include all costs associated with workers working outside of normal business hours and/or costs associated with workers working overtime as required to meet the specified project schedule. The Owner reserves the right to request work to be performed outside normal working hours and to limit Contractor activities when they conflict with Owner operations. Any increased costs due to Owner requirements for work outside normal hours not specified in the Contract Documents will be negotiated.

The Contractor shall maintain a daily field report including, but not limited to, listing of all personnel on site (including all Subcontractors), weather conditions, major scopes of work under construction, material deliveries, safety incidents, progress photographs, and inspections.

#### **ARTICLE 16 - SUBCONTRACTS and SUBCONTRACTORS**

All Subcontractors shall be identified in writing and approved by the Owner prior to the start of work

## **ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSION OF TIME, LIQUIDATED DAMAGES**

Time of completion is broken out into two separate parts for this project as follows (refer to sheet C302B for delineation of Part 1 Upper Portion, and Part 2 Lower Portion):

### **Part 1**

The Contractor shall commence work to be performed under this Contract on the date to be specified in the Notice to Proceed from the Contract Administrator and shall fully complete all work hereunder within One Hundred and Seventy Seven (177) consecutive calendar days from the date specified in the Notice to Proceed. The following are the critical dates for the project: Anticipated Notice to Proceed: April 8th, 2024; Site available for Work: immediately. Joyner Drive shall remain open to traffic until May 13<sup>th</sup>, 2024. Construction Completion: October 1<sup>st</sup>, 2024.

### **Part 2 – see scope per C302B**

The Contractor shall commence work to be performed under this Contract on the date to be specified in the Notice to Proceed from the Contract Administrator and shall fully complete all work hereunder within Eighty One (81) consecutive calendar days from the date specified in the Notice to Proceed. The following are the critical dates for the project: Anticipated Notice to Proceed: April 8th, 2024; Site available for Work: May 13<sup>th</sup>, 2024; Construction Completion: August 1<sup>st</sup>, 2024.

If the Contractor should fail to complete the work within the time specified (including approved Change Orders) and this failure directly prevents the Owner from utilizing and/or occupying the building premises or results in other direct costs to the Owner, Liquidated Damages in the amount of Five Hundred Dollars (\$500.00) per consecutive calendar day will be assessed for each day the schedule of the Work exceeds the contractual duration set forth in the contract or therefore extended by approved change order. Other reduction/restrictions to work hours, site use, and other construction general conditions may occur if the contract time extends beyond the contract time specified (including approved Change Orders).

If the Contractor is delayed at any time in the progress of the Contractor's work by any act or negligence of the Owner, the Owner's employees or the Owner's separate Contractor; by changes ordered in the work; by abnormal weather conditions; by any causes beyond the Contractor's control; or by other causes deemed justifiable by Owner, then the contract time may be reasonably extended in a written order from the Owner upon written request from the Contractor within ten (10) days following the cause for delay.

Non-compensable weather delays affecting the critical path shall be tracked during the period leading up to the building being dried-in, and calculated and awarded via Change Order if warranted, at the end of the construction period.

## **ARTICLE 34 – MINIMUM INSURANCE REQUIREMENTS**

Automobile Liability insurance (the "Auto Insurance") for claims and all perils for errors, omissions, and damages of any kind or character which may arise out of or result from Contractor's performance under this Agreement. The Auto Liability Insurance shall cover owned, hired, and non-owned commercial vehicles with policy limits of no less than \$150,000 bodily injury and property damage and \$150,000 uninsured/under insured motorist per occurrence.

## **ARTICLE 38 - USE OF PREMISES**

Work under this contract shall be performed in such a manner as to avoid interruption or interference with the operation of any existing activity on the premises or at the location of the work. The Owner may enforce extra restrictions during certain periods of the year. During examination periods, the Contractor shall restrict noise-making activities. If the project involves work in or near a building in which an exam is being conducted, the Contractor shall be required to restrict operations which are disturbing to students during the hours of the exam(s). Work will not be permitted on Graduation Day, or the day preceding it.



While on campus, Contractor's and Sub-Contractor's personnel shall be identifiable at all times, for example, by wearing company names or logos on garments or hard hats.

Damage done to the University premises that are under the control of the Contractor, or damage caused by the contractor to premises used by the contractor, shall be corrected at the Contractor's expense.

The contractor shall schedule deliveries between 7:00 am and 4:00 pm. The contractor shall have adequate personnel and any necessary equipment onsite to receive deliveries. The contractor shall notify the WCU Project Manager of any deliveries of equipment, material or road work that will impede the flow of vehicular or pedestrian traffic. The contractor shall provide traffic control by certified traffic control personnel (vehicular and pedestrian) during these deliveries. Staging for multiple concrete / steel / other large material deliveries, crane and other large pieces of equipment must be coordinated with the WCU Project Manager. Walks, streets, and drives are most congested with pedestrians at the top of the hour, when making deliveries the carrier should be made aware of this and plan his deliveries accordingly.

A minimum five working days' notice must be given to the WCU Project Manager to block parking spaces, drives, roads, streets and pedestrian walks.

Roads, streets, drives, fire lanes must remain open at all times. Adequate clearance must be maintained for emergency vehicles to negotiate the drive. Maintain a minimum of 20 feet for fire lanes. Construction vehicles are not allowed to block, park, or stage in a fire lanes. Vehicles blocking fire lanes will be ticketed and towed at the Contractor's expense.

Construction fences should be covered with fabric screening unless it blocks the view of oncoming traffic. Construction gates will swing into the construction area. The construction fences shall not obstruct pedestrian or vehicle traffic unless alternate ways were designed in the site drawings and approved by the WCU Project Manager.

The Contractor will provide additional cleanup, warning signs, and barricades if deemed necessary by the Owner.

The Contractor's scheduling and staging requirements must be coordinated with, and approved by, the WCU Project Manager.

Contractors working for the University are required to comply with Western Carolina University's policies, which are provided herein and hereby incorporated and made a part of this contract.

- Smoking and Vaping Policies  
<https://www.wcu.edu/discover/leadership/office-of-the-chancellor/legal-counsel-office/university-policies/numerical-index/university-policy-45.aspx>
- Alcoholic Beverages  
<https://www.wcu.edu/discover/leadership/office-of-the-chancellor/legal-counsel-office/university-policies/numerical-index/university-policy-81.aspx>
- Weapons on Campus  
<https://www.wcu.edu/discover/leadership/office-of-the-chancellor/legal-counsel-office/university-policies/numerical-index/university-policy-91.aspx>
- Campus/Workplace Violence Prevention and Management  
<https://www.wcu.edu/discover/leadership/office-of-the-chancellor/legal-counsel-office/university-policies/numerical-index/university-policy-109.aspx>

- Title IX Sexual Harassment Policy  
<https://www.wcu.edu/discover/leadership/office-of-the-chancellor/legal-counsel-office/university-policies/numerical-index/university-policy-129.aspx>

#### **ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS**

The Owner will provide water and electricity to the extent they are available at the project site. The Contractor shall be responsible for making connections to provided utilities.

The Contractor shall provide restroom facilities. The Contractor's personnel shall not use toilet or washroom facilities in the existing building.

The Contractor shall be responsible for procedures to make temporary disruptions to existing utilities serving the building(s) as well as disruptions to roads and pedestrian walks and any disruptions shall be planned well in advance of the work. The work shall be executed in a manner to provide reasonably continuous service throughout the construction period. Any and all disruptions and interruptions of service shall be coordinated with the WCU Project Manager a minimum of seven (7) days in advance. Failure of the Contractor to obtain Owner permission shall not be grounds for an extension of time.

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# **TECHNICAL SPECIFICATIONS**

## ADVERTISEMENT FOR BIDS

Sealed proposals will be received until 3:00pm  
(Time)

on March 5, 2024, in Facilities Management at Western Carolina University  
(Date) (Location)

for the construction of

Early Joyner Drive Infrastructure Package  
(Project)

at which time and place bids will be opened and read.

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

Jenkins-Peer Architects Divina Jones djones@jenkinspeer.com  
(Designer Name and Email)

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

Signed: The State of North Carolina through  
Western Carolina University  
(Owner)

# NOTICE TO BIDDERS

Sealed proposals will be received by the Western Carolina University in Cullowhee NC, in the office of Facilities Management up to 3:00 pm March 5, 2024 and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment entering into the construction of

## Early Joyner Drive Infrastructure Package

The general scope of this project involves the following:

- Realignment of Joyner Drive/Circle Drive intersection to create more efficient traffic pattern and easier gradients
- Widening of Joyner Drive to a two-lane road
- Sidewalk addition for both sides of Joyner Drive
- Electrical lighting infrastructure improvements

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

## Pre-Bid Meeting

An open pre-bid meeting will be held for all interested bidders on February 13, 2024 The meeting will address project specific questions, issues, bidding procedures and bid forms..

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

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

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

N/A

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

Complete plans, specifications and contract documents will be open for inspection at the following:

Western Carolina University Facilities Management

Jenkins Peer Architects at 112 South Tryon Street, Suite 1300, Charlotte, NC 28284

The electronic plan rooms of: Associated General Contractors, Carolinas Branch; McGraw-Hill Dodge Corporation; Reed Construction Data (RCD); Hispanic Contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh Areas – 877-227-1680

The Cherokee Business Development Center, PO Box 1200, Ginger Lynn Welch Complex, 810 Acquoni Road, Cherokee, NC 28719, Phone: 828-497 1666.

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

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

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

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

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

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

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

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

Designer:

Jenkins Peer Architects  
112 S Tryon St, Ste. 1300  
Charlotte, NC 28284  
704-372-6665

Owner:

Western Carolina University  
156 Joyner Drive  
Cullowhee, NC 28723



# FORM OF PROPOSAL

Early Joyner Drive Infrastructure Package  
Western Carolina University  
22-24697-01B

Contract: General Construction  
Bidder: \_\_\_\_\_  
Date: \_\_\_\_\_

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

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

State of North Carolina through Western Carolina University

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

Early Joyner Drive Infrastructure Package

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

Western Carolina University

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

## **SINGLE PRIME CONTRACT:**

Base Bid: \_\_\_\_\_ Dollars(\$)

General Subcontractor:  
\_\_\_\_\_ Lic \_\_\_\_\_

Plumbing Subcontractor:  
\_\_\_\_\_ Lic \_\_\_\_\_

Mechanical Subcontractor:  
\_\_\_\_\_ Lic \_\_\_\_\_

Electrical Subcontractor:  
\_\_\_\_\_ Lic \_\_\_\_\_

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

## **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.)

N/A

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

## **MINORITY BUSINESS PARTICIPATION REQUIREMENTS**

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

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

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

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

**\* OR \***

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

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

## Proposal Signature Page

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

Respectfully submitted this day of \_\_\_\_\_

\_\_\_\_\_  
(Name of firm or corporation making bid)

WITNESS:

\_\_\_\_\_  
(Proprietorship or Partnership)

By: \_\_\_\_\_  
Signature

Name: \_\_\_\_\_  
Print or type

Title \_\_\_\_\_  
(Owner/Partner/Pres./V.Pres)

Address \_\_\_\_\_

ATTEST:

By: \_\_\_\_\_

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 \_\_\_\_\_

## FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS THAT \_\_\_\_\_

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

Signed, sealed and dated this \_\_\_\_ day of \_\_\_\_ 20\_\_

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

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

\_\_\_\_\_(SEAL)

\_\_\_\_\_(SEAL)

\_\_\_\_\_(SEAL)

\_\_\_\_\_(SEAL)

\_\_\_\_\_(SEAL)

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

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

## **SECTION A: INTENT**

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

## **SECTION B: DEFINITIONS**

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

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

## **SECTION C: RESPONSIBILITIES**

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

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

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

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

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

2. State Construction Office

The State Construction Office will be responsible for the following:

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

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

### 3. Owner

Before awarding a contract, owner shall do the following:

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

### 4. Designer

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

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

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

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

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

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

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

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

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



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

6. **Minority Business Responsibilities**

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

**SECTION 4: DISPUTE PROCEDURES**

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

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

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

## MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

### APPLICATION:

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

### MINORITY BUSINESS SUBCONTRACT GOALS:

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

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

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

**OR**

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

**OR**

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

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

## **MINIMUM COMPLIANCE REQUIREMENTS:**

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

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

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

## APPENDIX E

### MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: \_\_\_\_\_

Address & Phone: \_\_\_\_\_

Project Name: \_\_\_\_\_

Pay Application #: \_\_\_\_\_ Period: \_\_\_\_\_

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

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

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

Date: \_\_\_\_\_ Approved/Certified By: \_\_\_\_\_

Name

Title

Signature

**SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT**



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

County of \_\_\_\_\_

(Name of Bidder)

Affidavit of \_\_\_\_\_

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

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

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

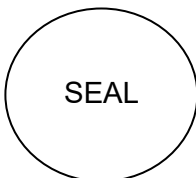
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure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

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

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

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

County of \_\_\_\_\_

Affidavit of \_\_\_\_\_  
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the \_\_\_\_\_  
\_\_\_\_\_ contract.  
(Name of Project)

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

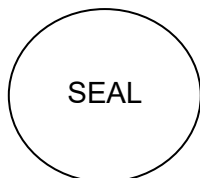
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

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

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

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

County of \_\_\_\_\_

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

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

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

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

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

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

Attach additional sheets if required

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

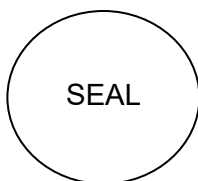
\*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

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

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

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

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_



Signature: \_\_\_\_\_

Title: \_\_\_\_\_

State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_



# State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of \_\_\_\_\_

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

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

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

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

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

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

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

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

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

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

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

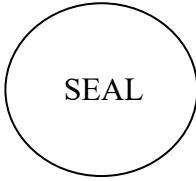
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

## FORM OF CONSTRUCTION CONTRACT

(ALL PRIME CONTRACTS)

THIS AGREEMENT, made the \_\_\_\_\_ day of \_\_\_\_\_ in the year of  
20\_\_ by \_\_\_\_\_ and \_\_\_\_\_ between \_\_\_\_\_

hereinafter called the Party of the First Part and the \*State of North Carolina, through  
the \_\_\_\_\_

\_\_\_\_\_ hereinafter called  
the Party of the Second Part.

### WITNESSETH:

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

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

\_\_\_\_\_  
\_\_\_\_\_

Consisting of the following sheets:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_

Dated: \_\_\_\_\_ and the following addenda:

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

2. That the Party of the First Part shall commence work to be performed under this  
agreement on a date to be specified in a written order of the Party of the Second Part and  
shall fully complete all work hereunder within \_\_\_\_\_ consecutive calendar days

from said date. For each day in excess thereof, liquidated damages shall be as stated in Supplementary General Conditions. The Party of the First Part, as one of the considerations for the awarding of this contract, shall furnish to the Party of the Second Part a construction schedule setting forth planned progress of the project broken down by the various divisions or part of the work and by calendar days as outlined in Article 14 of the General Conditions of the Contract.

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

---

(\$ \_\_\_\_\_).

Summary of Contract Award:

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

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

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

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

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

Witness:

\_\_\_\_\_  
Contractor: (Trade or Corporate Name)

\_\_\_\_\_  
(Proprietorship or Partnership)

By: \_\_\_\_\_

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

Attest: (Corporation)

By: \_\_\_\_\_

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec. only)

The State of North Carolina through\*

(CORPORATE SEAL)

\_\_\_\_\_  
(Agency, Department or Institution)

Witness:

\_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

## FORM OF PERFORMANCE BOND

Date of Contract: \_\_\_\_\_

Date of Execution: \_\_\_\_\_

Name of Principal  
(Contractor) \_\_\_\_\_

Name of Surety: \_\_\_\_\_

Name of Contracting  
Body: \_\_\_\_\_

Amount of Bond: \_\_\_\_\_

Project \_\_\_\_\_

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

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

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

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

Executed in \_\_\_\_\_ counterparts.

Witness:

\_\_\_\_\_  
(Proprietorship or Partnership)

Attest: (Corporation)

By: \_\_\_\_\_

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec. only)

(Corporate Seal)

Witness:

\_\_\_\_\_

Countersigned:

\_\_\_\_\_

\_\_\_\_\_  
(N.C. Licensed Resident Agent)

\_\_\_\_\_

\_\_\_\_\_  
Name and Address-Surety Agency

\_\_\_\_\_

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

\_\_\_\_\_  
Contractor: (Trade or Corporate Name)

By: \_\_\_\_\_

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

\_\_\_\_\_  
(Surety Company)

By: \_\_\_\_\_

Title: \_\_\_\_\_  
(Attorney in Fact)

(Surety Corporate Seal)

## FORM OF PAYMENT BOND

Date of Contract: \_\_\_\_\_

Date of Execution: \_\_\_\_\_

Name of Principal  
(Contractor) \_\_\_\_\_

Name of Surety: \_\_\_\_\_

Name of Contracting  
Body: \_\_\_\_\_

Amount of Bond: \_\_\_\_\_

Project \_\_\_\_\_

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

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

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

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

Executed in \_\_\_\_\_ counterparts.



Witness:

\_\_\_\_\_  
(Proprietorship or Partnership)

Attest: (Corporation)

By: \_\_\_\_\_

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec.. only)

(Corporate Seal)

Witness:

\_\_\_\_\_

Countersigned:

\_\_\_\_\_

\_\_\_\_\_  
(N.C. Licensed Resident Agent)

\_\_\_\_\_

\_\_\_\_\_  
Name and Address-Surety Agency

\_\_\_\_\_

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

\_\_\_\_\_  
Contractor: (Trade or Corporate Name)

By: \_\_\_\_\_

Title \_\_\_\_\_  
(Owner, Partner, or Corp. Pres. or Vice  
Pres. only)

\_\_\_\_\_  
(Surety Company)

By: \_\_\_\_\_

Title: \_\_\_\_\_  
(Attorney in Fact)

(Surety Corporate Seal)

## Sheet for Attaching Power of Attorney

## Sheet for Attaching Insurance Certificates

## APPROVAL OF THE ATTORNEY GENERAL

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

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

---

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

This \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

Signed \_\_\_\_\_  
Budget Officer

## SECTION 01 10 00 – SUMMARY

### PART 1 - GENERAL

#### 1.1 PROJECT

- A. Project Name: Moore Building Comprehensive Renovation
- B. Package: Early Joyner Drive / Infrastructure Package for Moore Building  
SCO ID# 22-24697-01B
- C. Owner's Name: Western Carolina University
- D. Architect's Name: Jenkins Peer Architects.
- F. The historic Moore Building, completed in 1924 as a women's dormitory, is one of the oldest remaining buildings on the campus of Western Carolina University (WCU). The four story, 54,750 square foot building is an excellent example of the Renaissance Revival style. The building is located on a prominent hilltop site near the center of campus. Over the life of the building, it has served as a women's dormitory, men's dormitory, infirmary, and in 1977, was converted into a Classroom/Laboratory teaching facility for the Health and Human Sciences department. It has remained a teaching facility up until 2011, at which point it has been since left vacant.

Joyner Drive is the main access road leading to the historic Moore Building. Joyner drive is currently a single lane access road with steep grading. With the vision of renovating the Moore Building into a state-of-the-art modern academic teaching facility, improved access to the building will be required. The scale of the renovation project will also require access to the building with modern full size construction trucks and equipment. The purpose of the Early Joyner Drive/Infrastructure project (SCO ID# 22-24697-01B) is to provide appropriate vehicular access to the Moore Building.

The general scope of this project involves the following:

- Realignment of Joyner Drive/Circle Drive intersection to create more efficient traffic pattern and easier gradients
- Widening of Joyner Drive to a two-lane road
- Sidewalk addition for both sides of Joyner Drive
- Electrical lighting infrastructure improvements

#### 1.2 CONTRACT DESCRIPTION

- A. Contract Type: General Contractor in accordance with North Carolina General Conditions of the Contract (Form OC-15 Second Edition – January 2013).
1. Throughout these specifications, references may be made to the Contractor, General Contractor, GC etc. In all cases, any reference of this type shall be interpreted as the General Contractor.

### 1.3 GC USE OF PREMISES

- A. The GC and all Subcontractors shall use only the roads designated by the University.
1. The GC and each sub-contractor must coordinate materials deliveries to the project site without recourse to University Staff assistance. Shipping documents must contain complete delivery instructions to include a site location, GC name, and telephone number for the delivery truck driver's use.
  2. Each sub-contractor using a yard hydrant, wall hydrant or hose bib must use the proper key or handle. A key or handle may be borrowed from Facilities Management. Damage from misuse or abuse will be billed to the offending Contractor. The use of Campus fire hydrants is strictly prohibited without prior permission from Facilities Management's Mechanical Engineer. The temporary use of any campus utility shall be metered.
  3. Each sub-contractor will ensure that vehicles and equipment are not loaded beyond their rated Gross Vehicle Weight, or other load restrictions. Vehicles operating on the Campus must comply with all State weight and axle restrictions. Sub-contractors will be held responsible for repair of damage caused by their vehicles.
  4. Explosive blasting generally is not allowed. In extreme rock conditions the blasting alternative may be considered. If blasting is approved, a comprehensive plan will be coordinated with Western Carolina University staff prior to execution.
  5. All equipment must be secured when staff is not on-site. Each sub-contractor must accept responsibility for physical security of tools, equipment, materials and other property on-site. The construction fence must be maintained and signed to prevent casual entry into the site.
  6. GC and sub-contractors are allowed to work from 8 a.m. to dusk, 7 days per week, except on Saturday during spring and winter commencements, provided the General Contractor's superintendent is on site.
  7. The GC and each sub-contractor are responsible for employee conduct and behavior on Campus. Harassment, verbal abuse, and other such behavior toward students, faculty, staff, or the general public will not be tolerated. Radios and other sound sources are not allowed on the project. All employees are required to wear shirts.
  8. The GC and each sub-contractor (and all employees) must comply with University Traffic Regulations and Emergency Procedures Manual. All North Carolina motor vehicle laws apply on Campus, including registration and inspection requirements.
  9. All materials, equipment, vehicles and employee vehicles must be contained within the limits of construction. Parking is extremely limited on Campus. If parking outside the project site becomes necessary, a parking area will be designated and parking permits will be required.
  10. Prior to initial occupation of the site, coordinate with Facilities Management and check in at the Facilities Management office.
  11. Weapons are prohibited on Campus. Signs to this affect shall be posted on the job site by the GC.
  12. Prior to any excavation at any location by any sub-contractor, the GC must coordinate with Facilities Management to establish utilities locations. A University representative in

company with the GC's representative will locate and mark location of utilities on the ground. The GC remains responsible for protecting existing utilities from damage.

13. GC will maintain safe pedestrian ways around the project site. Walkways and roads will not be blocked.
14. To the extent herein described there is no charge to GC for University provided utilities except telephone service. Current telephone charges will be provided upon request. The University will provide power at no cost for office trailer and small tools. The University will identify utility sources and the contractor will be responsible for all costs associated with tie-in, metering, and distribution.
15. Utilities outages must be coordinated with Facilities Management at least 30 days prior to the period of the outage. For some critical circuits, longer lead times may be necessary.
16. The GC shall ensure that all sub-contractors provide all labor, materials, tools and equipment required to accomplish the work. The University will not furnish or loan anything except where contract documents so indicate. The GC is responsible to insure that all suppliers, Prime Subcontractors, their agents, employees and lower tier subs, adhere to the Contract documents and that they provide all products on time.
17. No sub-contractor shall use any facility beyond the limits of construction.
18. Added Items to be provided to the GC by the University:
  - a. Campus Telephone List
  - b. Facilities Management Telephone List
  - c. Campus Map
  - d. Western Carolina University Emergency Procedures Manual
  - e. Western Carolina University Traffic Regulations

#### 1.4 GC'S SAFETY GUIDE

- A. General: It is University policy to provide a working, teaching, and learning environment as free as possible of recognized hazards to the safety and health of students, faculty, staff and visitors. The GC and all sub-contractors are required to comply with that policy. All safety, health, and fire protection rules, regulations, policies and procedures that apply to Western Carolina University personnel shall also apply to the GC, their sub-contractors and their employees. Prior to initiating any contractual operations, the GC's on-site supervisors shall become thoroughly familiar with Western Carolina University safety rules, procedures, emergency and disaster instructions plus all applicable state and federal safety and health regulations. The details of the Western Carolina University Safety Program are available at <https://www.wcu.edu/discover/campus-services-and-operations/facilities-management/safety-and-risk-management/>. GC shall establish and maintain a functioning safety program including safety meetings and site inspections for the purpose of controlling unsafe acts and conditions at the work site. General Contractor shall fill out and submit directly to the Owner the Contractor Program Safety Checklist available at the website indicated above no later than 14 days after Notice to Proceed.
- B. Specific:
  1. In case of fire, medical, ambulance or safety concern dial 911.



2. Hazard Communication notifications will be made to campus Extension 2200.
  3. Notify Western Carolina University of any hazardous or unusual operation.
  4. Notify Western Carolina University of any impairment of fire protection.
  5. Barricades must be erected a safe distance (at least 6') from perimeter of construction area.
  6. A chemical spill prevention plan must be in effect.
  7. Accomplish regular removal of scrap and debris.
  8. All welding, cutting, or hot work must comply with appropriate safety standards.
  9. No parking on sidewalks except as necessary during a specific task.
  10. Designate a safety and health coordinator for the project, or assign that responsibility to the on-site supervisor.
  11. Comply with Western Carolina University posted "No Smoking" rules.
- C. The GC is to provide coordination with the Owner's staff to minimize damage to the Facilities Management and to have responsibility for repairs necessary.
- D. Traffic Control: The GC shall develop and submit a traffic control plan. Plan shall include narrative and drawings as necessary to describe a comprehensive Traffic Control Plan for all construction-related traffic to and from the project site. Plan shall indicate details for traffic control procedures, required personnel, barriers and all other necessary means to provide a safe construction zone and surrounding area for workers, students, faculty, staff and visitors.

## 1.5 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner after Final Acceptance.

## 1.6 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Final Acceptance.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

## 1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine

numbers and names of Sections in the Contract Documents.

2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 10 00

## SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.

#### 1.2 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions of the Contract (Form OC-15, Second Addition January 2013).
- B. Document 00 73 00 – Supplementary General Conditions

#### 1.3 SCHEDULE OF VALUES

- A. After the award of the Contract, the General Contractor shall promptly submit to the Designer for review and Owner approval a complete schedule of values of the various parts of the work listed in the numerical order of the specifications. The schedule shall be dated and signed by the General Contractor and shall include a description of the work, quantities, labor, materials, and total Contract amount for each item. Upon Owner approval of this schedule of values, the schedule shall be used as the basis for determining monthly payments and, therefore, is needed in advance of the General Contractor submitting the first application and certification for payment. At a minimum, provide separate line items for material and labor for each Section of the Table of Contents. Should the schedule of values include any value for mobilization, there shall also be included an equal value for demobilization. The Schedule of Values shall be submitted using the same form(s) that will be used for Applications for Payment.
  - 1. Line items performed by minority contractors shall be coordinated with Minority Participation documentation and identified on the Schedule of Values.
- B. Coordination: Coordinate preparation of the Schedule of Values with preparation of General 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.
    - c. Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than twenty-one days before the date scheduled for submittal of initial Applications for Payment.
- C. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide and identify scheduled value line items by Specification Section. Each Section must be broken down into a minimum of one individual line item for materials and one for labor. Provide adequate additional breakdown for each Section by floor, elevation, area, equipment type etc. as is necessary to accurately assess the progress of the Work for payment purposes.

1. Identification: Include the following Project identification on the Schedule of Values:
  - a. Project name and location.
  - b. Name of Architect.
  - c. Architect's project number.
  - d. Contractor's name and address.
  - e. Date of submittal.
2. Provide line items for the following:
  - a. Mobilization.
  - b. Demobilization equal to the scheduled value for mobilization for any Section or subcontractor.
  - c. Closeout equal to 1/4 of 1 percent of construction contract amount.
  - d. Coordination Drawings.
  - e. Punchlist/inspections.
  - f. Delegated design engineering requirements as required in the individual Sections.
3. Submit draft of AIA Document G703 Continuation Sheets.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. 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 a single separate "General Conditions" line item in the Schedule of Values or distributed proportionately to all other line items as general overhead expense, at GC's option.
    - i. Where the GC elects to have a General Conditions line item, payment shall be requested equally for each pay application over the length of the construction contract or shall be proportionate to the total percentage of work complete. Determination of which method shall be finalized by the Owner, GC and designer prior to the submittal of the first pay application.
  - b. Line items for Submittals shall not be permitted except where a Specification section explicitly requires delegated design engineering services as part of the required submittals for that Section. Provide separate line items for delegated design engineering for each individual specification section that requires such engineering.
7. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.4 APPLICATIONS FOR PAYMENT

- A. The Request for Payment shall be on forms similar to AIA Document G703, latest edition. When Request for Payment includes materials stored other than within the boundaries of the State of North Carolina, request for Payment will not be considered and another Request for Payment shall be made. General Contractor shall also attach to the application all receipts and vouchers required to verify the requested payments for stored materials. No payment made to the General Contractor by the Owner shall constitute acceptance of any work or materials not in accordance with the true intent of the Contract.
  1. Stored Materials: The Designer is required to inspect all materials stored off-site and upon which payment is requested. Outside of a 25-mile radius from the project site, the GC shall

- reimburse all expenses for such inspections incurred by the Designer via deductive change order to the Owner/GC Contract.
- a. The GC shall provide minimum 7 days written notice to the Designer for any requested stored materials inspections. Notice to the designer shall include all documentation for insurance coverage, storage facility bonding etc. as required by the General Conditions. The Designer will not schedule off site materials inspections without the required documentation.
  - b. Regardless of location of stored materials, no request for payment shall be certified on materials that are not in their final condition ready for installation.
3. 'Pencil' Copy - Prior to submitting hard copies for final certification by the Designer, The GC shall submit via email to the Architect and Owner a draft, electronic copy in PDF format of each Pay Application for review. Within 5 days of receipt, the Designer shall provide Owner and Designer comments and corrections needed for final certification. GC shall make necessary adjustments and corrections per these comments and submit final hard copies for certification. Designer will NOT mark up hard copies of Applications for Payment. Incorrect Applications for Payment will be returned without certification to the GC for correction.
  4. Payment for delegated design engineering line items shall be made ONLY upon review and acceptance of such engineering by the Designer. No partial payments for delegated design shall be requested or approved.
  5. No partial payments for coordination drawings shall be requested or approved
- B. The General Contractor shall additionally include on each monthly Application for Payment the following statement: "We certify that the Surety for this Project has been duly notified of the amount of this request." Unless exception to pay is made by the Surety to the Designer within 4 calendar days following the date of request, it will be assumed that the Surety concurs in the payment of this application.
  - C. American Institute of Architects Document G703, if used, may generally be obtained at office supply firms or directly from the American Institute of Architects, 1735 New York Avenue, Washington, D. C. 20036.
  - D. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours.
  - E. Each application for payment shall include North Carolina State Construction Office Appendix E form, attached to the end of this section.
  - F. 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. GC's Construction Schedule (preliminary if not final).
    3. Products list.
    4. Submittals Schedule (preliminary if not final).
    5. List of GC's staff assignments.

- G. Final Payment Application: The Final Payment of retained amount due the General Contractor on account of the Contract shall not become due until the GC has furnished to the Owner, through the Designer, Guarantees as set forth in the General and Supplementary General Conditions including all Guarantees required by specific Sections of the Project Manual. In addition to the above, all other submissions required by other Articles and Sections of the Project Manual must be in the hands of the Designer before approval of final payment. 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. NCSCO, "Contractor's Affidavit of Payment of Debts and Claims."
  5. NCSCO, "Contractor's Affidavit of Release of Liens."
  6. NCSCO "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 20 00

## APPENDIX E MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: \_\_\_\_\_

Address & Phone: \_\_\_\_\_

Project Name: \_\_\_\_\_

SCO Project ID: \_\_\_\_\_

Pay Application #: \_\_\_\_\_ Period: \_\_\_\_\_

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

MBE FIRM NAME	* TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

\*Minority categories: Black (B), Hispanic (H), Asian American (AA), American Indian (AI), White Female (WF), Socially and Economically Disadvantaged (SED)

Approved/Certified By:

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

**SUBMIT WITH EACH PAY REQUEST - FINAL PAYMENT - FINAL REPORT**

## SECTION 01 21 00 - ALLOWANCES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Cash allowances.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 26 00 - Contract Modification Procedures: Additional payment and modification procedures.

#### 1.3 LUMP SUM AND QUANTITY OF WORK (UNIT-COST) ALLOWANCES

- A. Where applicable, allowance shall include cost to the Contractor of specific products and materials ordered by the Owner or selected by the Design Professional under allowance and shall include taxes, freight, and delivery to the Project site.
- B. The Contractor's costs for receiving and handling at the Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by the Owner or selected by the Design Professional under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Quantity of Work Unit Cost Allowances: The total value of the allowance shall be determined by the quantity indicated in the allowance description multiplied by the unit price provided on the contractor's bid form.
- E. Differences in costs will be adjusted by Change Order.

#### 1.2 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts and scope of Work, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where it is indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  - 4. The Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
  - 5. No change to the Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.



#### 1.4 SUBMITTALS

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

#### 1.5 ALLOWANCES SCHEDULE

- A. Allowance No. 1: Unsuitable Soil Removal and Replacement with Fill: Provide Allowance for removal and disposal of 1,000 cubic yards including replacement with stone as specified in 3120000. (Coordinate storage of soil removed with GC for use on Moore Building Package A)
- B. Allowance No. 2: Unsuitable Soil Removal and Replacement with Fill: Provide Allowance for removal and disposal of 1,000 cubic yards including replacement compacted soil as specified in 3120000. (Coordinate storage of soil removed with GC for use on Moore Building Package A)
- C. Allowance No. 3: Mass Rock Removal: Provide allowance for removal and disposal of 500 cubic yards as specified in Section 312000.
- D. Allowance No. 4: Trench Rock Excavation and Replacement with Fill: Provide allowance for removal and disposal of 50 cubic yards including replacement with borrowed suitable material as specified in Section 312000.
- E. Allowance No. 5: CABC Stone - 50 tons
- F. Allowance No. 6: CLASS II RIP RAP – 10 tons
- G. Allowance No. 7: MIRAFI HP 370 – 100 square yards
- H. Allowance No. 8: Washed Stone – 50 tons
- I. Allowance No. 9: 6” PVC Perforated French Drain 100 linear feet

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 21 00

## SECTION 01 22 00 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

#### 1.2 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

#### 1.3 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect and/or Owner's testing agency.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.

#### 1.4 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
  - 1. Value of allowances in section 012100 shall be determined by the allowance quantity indicated multiplied by the associated unit price value provided by the contractor on the bid form.
- B. Payment will not be made for any of the following:
  - 1. Products wasted or disposed of in a manner that is not acceptable.
  - 2. Products determined as unacceptable before or after placement.
  - 3. Products remaining on hand after completion of the Work.
  - 4. Loading, hauling, and disposing of rejected Products.

## 1.5 UNIT PRICES SCHEDULE

- A. Unit Price No. 1: Unsuitable Soil Removal and Replacement with Fill: Provide Allowance for removal and disposal of 1,000 cubic yards including replacement with stone as specified in 3120000. (Coordinate storage of soil removed with GC for use on Moore Building Package A)
- B. Unit Price No. 2: Unsuitable Soil Removal and Replacement with Fill: Provide Allowance for removal and disposal of 1,000 cubic yards including replacement compacted soil as specified in 3120000. (Coordinate storage of soil removed with GC for use on Moore Building Package A)
- C. Unit Price No. 3: Mass Rock Removal: Provide allowance for removal and disposal of 500 cubic yards as specified in Section 312000.
- D. Unit Price No. 4: Trench Rock Excavation and Replacement with Fill: Provide allowance for removal and disposal of 50 cubic yards including replacement with borrowed suitable material as specified in Section 312000.
- E. Unit Price No. 5: CABC Stone - 50 tons - as specified in Section 32 00 00
- F. Unit Price No. 6: CLASS II RIP RAP – 10 tons - as specified in Section 32 00 00
- G. Unit Price No. 7: MIRAFI HP 370 – 100 square yards - as specified in Section 31 00 00
- H. Unit Price No. 8: Washed Stone – 50 tons - as specified in Section 32 00 00
- I. Unit Price No. 9: 6” PVC Perforated French Drain 100 linear feet

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 22 00

## SECTION 01 23 00 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Alternate submission procedures.
- B. Documentation of changes to Contract Sum and Contract Time.

#### 1.2 RELATED REQUIREMENTS

- A. Instructions to Bidders and General Conditions of the Contract (OC-15): Instructions for preparation of pricing for alternates.
- B. Bid Forms: List of alternates on the Bid Form.

#### 1.3 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each alternate
- C. Proposed cost of each Alternate is turnkey and includes all material, labor, overhead, profit, freight etc. No additional costs will be accepted for any accepted alternate other than the cost included on the bid form.

#### 1.4 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 – Alternate No.1 for this Package Coordinates to Alternate #3 of SCO ID# 22-24697-01A – STEAM TUNNEL RESTORATION (Ref. Sheet M-101B MECHANICAL – STEAM LINE)
- B. Alternate No. 2 – (Owner Preferred) – Provide the following: Architectural Area Lighting type B – Pole Light, die cast aluminum, gasket sealed, 227V, 37.8 Watt, 4000K, 70 CRI, Type 3. Grey, UL Wet location rated, photocontrol, standard mount.(Ref. sheet E100B ELECTRICAL – GENERAL AND DETAILS)

### PART 3 - EXECUTION - NOT USED

END OF SECTION 01 23 00

## SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

#### 1.3 DEFINITIONS

- A. Overhead: Includes all General Conditions of the Contract and all general requirements such as project management, scheduling, home office expense, layout, drawing and specification reproduction, testing and inspection, submittal preparation (including shop drawings other than those indicated as delegated design with specific engineering requirements) and coordination, cost estimating, supervision except as outlined herein, small tools and expendable items, taxes, temporary facilities and services including access and safety provisions, as-built drawings etc.

#### 1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue, with consultation with the Owner, supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Architect's Supplemental Instructions" form.

#### 1.3 PROPOSAL REQUESTS

- A. Owner/Designer-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 7 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include breakdown of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      - 1) Breakdown of material and labor costs shall be submitted in the form of sub-contractor proposals, vendor quotes etc. Change proposals submitted without adequate backup documentation will be returned for correction.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- 1) Costs for small tools, cutting blades, drill bits, measuring tools etc. that would normally be used by the contractor(s) for their day-to-day scope of work will not be accepted for change order work unless the scope of the change necessitates special purchase. Otherwise, costs for these items will be included as part of overhead and profit allowances per the General Conditions.
  - c. Include costs of labor and supervision directly attributable to the change.
    - 1) For all Change Order Proposals, supervision shall be charged only for on-site field supervision directly attributable to the change (working foreman etc.) and shall be charged at a rate that represents reasonable supervisory participation in the scope of Work covered by the change. All other project management 'soft costs' will be included as part of overhead and profit allowances per the General Conditions.
    - 2) GC shall submit labor rates including burden for all sub-contractors to be used for change order work. No change order shall be approved for any subcontractor without labor rates submittal.
  - d. Include an updated GC's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - e. All costs over \$250.00 shall be supported by sufficient documentation as described above.
- B. GC-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, General Contractor may propose changes by submitting a request for a change to Architect.
  1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - a. Costs for small tools, cutting blades, drill bits etc. that would normally be used by the contractor(s) for their day-to-day scope of work will not be accepted for change order work unless the scope of the change necessitates special purchase. Otherwise, costs for these items will be included as part of overhead and profit allowances per the General Conditions.
  4. Include costs of labor and supervision directly attributable to the change.
    - a. For all Change Order Proposals, supervision shall be charged only for on-site field supervision directly attributable to the change (working foreman etc.) and shall be charged at a rate that represents reasonable supervisory participation in the scope of Work covered by the change. All other project management 'soft costs' will be included as part of overhead and profit allowances per the General Conditions.
  5. Include an updated GC's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the

Contract Time.

6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Architect will use AIA Document G709 for Proposal Requests.

D. Cost of Change Worksheet: All change proposals shall be accompanied by completed cost of change worksheet included at the end of this section

#### 1.4 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or GC's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

1. Do not include GC's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to GC's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

#### 1.5 CHANGE ORDER PROCEDURES

A. Change Orders shall be processed according to NCSCO Electronic Change Order Process. GC, Owner and Designer shall familiarize themselves with this process and follow the requirements as detailed at the NCSCO website:

<http://interscope2.doa.state.nc.us:8080/interscope/help/ChangeOrders.pdf>.

#### 1.6 FIELD WORK ORDERS

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 26 00



## SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. RFI procedures.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- B. Section 01 78 00 - Closeout Submittals: Project record documents.

#### 1.3 PROJECT COORDINATION

- A. The Project Coordinator shall coordinate all work of his Contract to produce the required finished Project in accordance with the Contract Documents. Special attention shall be given to the submission of shop drawings, product data, samples, color charts, and requests for substitution within the specified time; furnishing the proper shop drawings to Subcontractors, and products suppliers, whose work and equipment is affected by and related thereto; and the furnishing of all information concerning locations, type, and size of built-in equipment and products and equipment utilities. This coordination is in addition to all other coordination requirements called for in the Technical Sections of the Project Manual and on the drawings.
- B. Project Coordinator: General Contractor (GC)
- C. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- D. During construction, coordinate use of site and facilities through the Project Coordinator.
- E. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- F. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- G. Coordinate field engineering and layout work under instructions of the Project Coordinator.

- H. Make the following types of submittals to Architect through the Project Coordinator:
1. Requests for information.
  2. Requests for substitution.
  3. Shop drawings, product data, and samples.
  4. Test and inspection reports.
  5. Manufacturer's instructions and field reports.
  6. Applications for payment and change order requests.
  7. Progress schedules.
  8. Closeout submittals.
- I. The Project Coordinator shall maintain a record of all items noted on the Architect/Engineer's Observation of Work in Progress, the subcontractor responsible for completing the work, and the date the work was completed.
- J. The General Contractor shall keep a Superintendent on the Project during the progress of the Work, for purposes of coordination with Prime Subcontractors, and if required by the Owner. GC and sub-contractors are allowed to work any day of the year, except at times when the Owner may have special events which would be disrupted by construction activities.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION

### 3.1 PRECONSTRUCTION CONFERENCE

- A. The Architect shall schedule a preconstruction conference before starting construction, at a time convenient to State Construction Office, Owner and Architect. The conference shall be held at Project site or another convenient location. The Architect shall arrange for the preconstruction conference in coordination with the SCO Project Monitor assigned. He shall then give written notice to the GC, the Owner and the State Construction Office as to the time and place of this conference. The GC shall notify all subcontractors of the time, date and location of the Preconstruction conference. The purpose of this meeting is to review the requirements of the Project and the requirements of the State Construction Office and to coordinate activities for all construction. The Architect shall send copies of the minutes of this conference to all contractors, the Owner, the State Construction Office and to other interested parties. No preconstruction conference will be scheduled or starting date established until all contracts have been signed, approved and distributed to all parties.

1. Attendees: Authorized representatives of State Construction Office, Owner, Architect, and their consultants; General Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
- B. Agenda: Shall follow NCSCO Preconstruction Meeting Requirements and Agenda and to discuss items of significance that could affect progress, including the following:
  1. Tentative construction schedule.
    - a. Designation of key personnel and their duties.
    - b. Procedures for processing field decisions and Change Orders.
    - c. Procedures for RFIs.
    - d. Procedures for testing and inspecting.
    - e. Procedures for processing Applications for Payment.
    - f. Distribution of the Contract Documents.
    - g. Submittal procedures.
    - h. Preparation of Record Documents.
    - i. Use of the premises and existing building.
    - j. Work restrictions.
    - k. Owner's occupancy requirements.
  2. Minutes: Architect will record and distribute meeting minutes.

### 3.2 PREINSTALLATION CONFERENCES

- A. General Contractor shall conduct a pre-installation conference 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 Architect 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. The 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 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 reconvened the conference at earliest feasible date.
6. Minutes: General Contractor shall record and distribute meeting minutes.

### 3.3 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. The General Contractor and each of his Prime Subcontractors shall keep a Superintendent on the Project during the progress of the Work, for purposes of coordination with other Prime Subcontractors, and if required by the Owner, regardless of whether said Contractor or Prime Subcontractor has work currently in progress. GC and sub-contractors are allowed to work any day of the year, except at times when the Owner may have special events which would be disrupted by construction activities.

### 3.4 PROGRESS MEETINGS

- A. The General Contractor shall conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests. All in-house consultants and contract consultants whose design is under current active construction shall be present at the job site for monthly meetings.
  1. The consultants shall be available to answer questions and resolve all problems within their respective discipline. These meetings shall be open to subcontractors, material suppliers and any others who can contribute toward maintaining required job progress. The General Contractor shall request that each prime contractor be represented by both home office and project personnel. These representatives shall have authority to act on behalf of the contractor. It shall be the purpose of these meetings to effect coordination, cooperation and assistance in maintaining progress of the project on schedule in order to complete the project within the contract time. The format of these meetings shall include the following:
    - a. Review minutes of last job conference and resolve all uncorrected problems.

- b. Review the construction schedule for completion by all contractors and update when necessary. (Progress of work and field observations since previous meeting).
    - c. Review of Designer's Logs. (Issues, Information & Instructions; Proposals and Modifications).
  2. Attendees: In addition to representatives of State Construction Office, Owner and Architect, General Contractor, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Shall follow NCSCO Monthly Meetings Agenda.
    - a. Minutes: The General Contractor shall prepare and submit to the Owner, GC and the State Construction Office representative (Project Monitor) minutes of the monthly meeting. These minutes shall include a roster of all participants and all documentation of all items relating to project status and progress. In addition, minutes shall be distributed to all parties present or should have been present, no later than 7 days after each meeting.
    - b. Updating. General Contractor shall revise Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule within 7 days of meeting.

### 3.5 DAILY CONSTRUCTION REPORTS

- A. General Contractor shall maintain a daily Construction Report to include, but not limited to the following data:
  1. Reports are to be numbered consecutively with a report for every calendar day for the duration of the contract, commencing on the date of Notice to Proceed and terminating with Project Acceptance including weekends and holidays.
  2. Date.
  3. Each contractor and subcontractor to be listed separately with a brief description of work performed each day by each sub-contractor.
  4. Each sub-contractor's number of personnel indicating quantity by classification, i.e. foremen, journeymen, and apprentices. Personnel are to be totaled daily indicating total for day or report and cumulative man days to date. (Definition of man days; 6 men indicated on job = t man days).
  5. Visitors to site indicated by name and affiliation.
  6. Any unusual occurrences are to be reported in detail.
  7. Any outstanding information required, delays to the work, etc., are to be noted separately on the report.
  8. Weather and site conditions.
- B. Report shall be available to the Architect and Owner upon request.

### 3.6 REQUESTS FOR INTERPRETATION (RFIs)

- A. General: If, in the opinion of the GC, work is indicated or is specified in such manner as will make it impossible to produce a first-class of work, or should discrepancies appear within the Contract Documents, he shall refer same to the Designer for interpretation before proceeding with work. If the GC fails to make such reference, no excuse will thereafter be entertained for failure to carry out work in a satisfactory manner. Where only part of the work is indicated, similar parts shall be considered repetition. Where any detail is shown and the components therefore are fully described, similar details shall be construed to require equal materials and construction.
- B. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with General Contractor. RFIs submitted by entities other than General Contractor will be returned with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in General Contractor's work or work of subcontractors.
  3. All RFI's shall be submitted to the Designer electronically via email or through the designer's Sharefile site in PDF format. Consideration may be given for use of the GC's web-based information sharing system. However, the GC and the Designer shall keep individual RFI logs to be reconciled on a regular basis. The Designer's log shall be recognized as the official Project log.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Date.
  3. Name of Contractor.
  4. Name of Architect.
  5. RFI number, numbered sequentially.
    - a. RFI's answered by the GC without input from the Designer or Owner shall not be included in the Project RFI logs.
  6. Specification Section number and title and related paragraphs, as appropriate.
  7. Drawing number and detail references, as appropriate.
  8. Field dimensions and conditions, as appropriate.
  9. General Contractor's suggested solution(s). If General Contractor's solution(s) impact the Contract Time or the Contract Sum, General Contractor shall state impact in the RFI.
  10. General Contractor's signature.
  11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    - a. Supplementary drawings prepared by GC or sub-contractors shall include dimensions, thickness, structural grid references, and details of affected materials, assemblies, and

attachments.

- C. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format. HTML documents are not acceptable and must be converted to PDF format.
  2. Each RFI shall be assembled and submitted as a single electronic file including cover sheet and any attachments. RFI's submitted as multiple or separate files for one RFI will not be reviewed.
- D. Architect's Action: Architect will review each RFI, determine action required, and return it. The Architect will endeavor to respond to RFI's in an average of seven (7) working days. It is acknowledged and understood that some RFI's will require longer response time than others. RFIs received 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 coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFIs or RFIs with numerous errors.
    - g. RFI's requesting confirmation of written direction by other means from the Owner or Architect.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for General Contractor to submit Change Proposal.
    - a. If General Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if General Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Software log with not less than the following:
1. Project name.
  2. Name and address of GC and sub-contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were dropped and not submitted.
  5. RFI description.
  6. Date the RFI was submitted.

7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

### 3.7 CONSTRUCTION DOCUMENTS

- A. The Owner will provide Drawings and Specifications to General Contractor free of charge for construction purposes the number of sets scheduled in General Conditions of the Contract (OC-15). Additional Drawings and/or Specifications will be furnished on request at direct material cost plus 25% for handling.
  1. All work shall be in accordance with the Contract Documents. No change therefrom shall be made without a review by the Designer. Where more detailed information is needed, or when an interpretation of the Contract Documents is needed, the GC, before proceeding with the work, shall refer the matter to the Designer who will furnish information or interpretation in the form of a Field Order or other written forms or drawings. If any errors, inconsistencies or omissions in the Contract Documents are recognized by the GC or any member of his organization, the GC shall notify the Designer in writing of such error, inconsistency or omission before proceeding with the work.
  2. When compliance with two or more requirements, material or equipment are specified and the requirements, material or equipment establish conflicting specifications or quality levels, the GC shall comply with the most stringent of higher quality specification. The Designer shall be the sole authority for determining the highest quality specification.
  3. Should the specifications and drawings fail to particularly describe the material or kind of goods to be used in any place, then it shall be the duty of the GC to make inquiry of the designer for what is best suited. The material that would normally be used in this place to produce first quality finished work shall be considered as part of the Contract.

END OF SECTION 01 30 00



## SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Preliminary Construction Schedule.
  - 2. GC's Construction Schedule.
  - 3. Submittals Schedule.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Field condition reports.
  - 7. Coordination Drawings
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
  - 2. Division 01 Section "Photographic Documentation" for submitting construction photographs.
  - 3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

#### 1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical 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 Architect.
- 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. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - 2. 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 story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

### 1.3 SUBMITTALS

- A. Qualification Data: For scheduling consultant.
- B. Submittals Schedule: Submit electronically in PDF format. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.
  - 3. Submittal category (action or informational).
  - 4. Name of subcontractor.
  - 5. Description of the Work covered.
  - 6. Scheduled date for Architect's and General Contractor's final release or approval.
- C. Preliminary Construction Schedule: Submit electronically in PDF format.
  - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

- D. Preliminary Network Diagram: Submit electronically in PDF format, large enough to show entire network for entire construction period. Show logic ties for activities.
- E. GC's Construction Schedule: Submit electronically in PDF format. Provide "E"- sized 24" x 36" color sheets to the Owner for preliminary schedule and all updates that show entire schedule for entire construction period. Additionally, provide 11 x 17 color plots for Architect, Owner and NCSCO monitor at monthly meetings.
  - 1. The submittal of a fully revised and acceptable construction schedule shall be a precedent to the processing of the second monthly pay application.
- F. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated 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 General Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

## 1.4 COORDINATION

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

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and

General Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of General Contractor's Construction Schedule.
  - a. The final submittals schedule shall be an excerpt from the CPM schedule. The schedule shall indicate the items, relevant specifications sections, other related submittals, the date when such item will be furnished to the Architect, and the date by which Architect's review is necessary to maintain Construction Schedule. This schedule shall take into consideration the resubmission of shop drawings required to achieve acceptance of the Designer and Owner.
  - b. If submittal of any required submittals, completion of any part of the work or the delivery of equipment or materials is behind the construction schedule and will impact the end date of the work past the contract completion date, the shall submit, in writing, a plan acceptable to the Owner for completing the work on or before the current completion date. No extension of time shall be approved for failure of GC to provide submittals in a timely fashion.

2.2 GENERAL 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 to Proceed until date of Final Acceptance.
  1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate 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 21 days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following 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 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in General Contractor's Construction Schedule with Submittals Schedule.
  4. Startup and Testing Time: Include not less than 21 days for startup and testing.
  5. Project Acceptance: Indicate completion in advance of date established for Project

Acceptance, and allow time for Architect's and General Contractor's administrative procedures necessary for certification of Final Acceptance.

6. The Construction schedule shall anticipate all weather delays which may be predicted from an analysis of weather reports for the last 5 years and allowances for rock and unsuitable soil removal. The schedule shall also include all major milestones and all anticipated and required inspections, shutdowns/outages for electrical, water, natural gas and steam tie-ins as applicable.
- 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 by Owner: Include a separate activity for each portion of the Work performed by Owner.
  2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  3. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Partial occupancy before Final Acceptance.
    - d. Provisions for future construction.
    - e. Seasonal variations.
    - f. Environmental control.
  4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Sample testing.
    - f. Deliveries.
    - g. Installation.
    - h. Tests and inspections.
    - i. Adjusting.
    - j. Curing.
    - k. Startup and placement into final use and operation.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Project Acceptance, 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. GC shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance

manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

2. Each activity cost shall reflect an accurate value subject to approval by Architect.
3. Total cost assigned to activities shall equal the total Contract Sum.
4. Provide a cumulative monthly cost projection along the bottom of the CPM schedule. Schedule shall be resource loaded.

- G. 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.

## 2.3 GENERAL CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare General Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled logic CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.
    - a. Failure to include any work item required for performance of this Contract shall not excuse General Contractor from completing all work within applicable completion dates, regardless of Architect'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. Include list of nonworking days and holidays incorporated into the schedule.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary 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. Provide dates of commencement and completion of each of the various stages of the work of each Specification section (including lead time activities, drawing and sample submissions, bidding, awarding subcontracts, manufacturing and shipping, and delivery dates for material and equipment. The schedule shall show a complete itemized breakdown of the work, and shall include networks for all phases of the work including networks for all work to be performed by all sub-contractors.
  2. The schedule shall not indicate any on-site construction activity longer than 21 consecutive calendar days or any other activity longer than 28 consecutive calendar days. Any activity with an anticipated longer duration must therefore be broken down into component

- activities, each of which has duration of no longer than 21 or 28 days respectively for on-site and other activities. Include estimated time frames for the following activities:
- a. Preparation and processing of submittals.
  - b. Mobilization and demobilization.
  - c. Purchase of materials.
  - d. Delivery.
  - e. Fabrication.
  - f. Utility interruptions.
  - g. Installation.
  - h. Work by Owner that may affect or be affected by General Contractor's activities.
  - i. Testing and commissioning.
  - j. Weather delays based on analysis of weather reports for the last 5 years.
  - k. Allowances for rock and unsuitable soil removal.
  - l. Major milestones including all required inspections.
3. 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. The CPM schedule and all other construction schedules shall include 1 and only 1 critical path which shall be clearly indicated.
4. Float: All schedule float, slack time, or contingency within the schedule jointly belongs to the Owner and GC.
- a. The Owner shall be entitled to require early completion and cleanup of portions of the Work (i.e. the difference in time between the project's early completion and the required completion date and total float within the entire schedule is not for the exclusive use of the Owner or the GC, but is jointly owned by each and is a resource available to and shared by each of the parties as needed to meet contract milestones and the contract completion dates with the Owner receiving the initial benefit.)
  - b. The GC shall not sequester shared float through such strategies as extending activity duration estimates to consume available float, using preferential logic or using extensive crew/resource sequencing etc. Since float time written in the schedule is jointly owned, no time extensions will be granted until a delay occurs which extends the work beyond the contract completion date.
  - c. It is acknowledged that Owner-caused delays may be offset by Owner-caused time savings including, but not limited to, critical path submittals being returned in less time than allowed by the contract, approval of substitution requests, changes to the scope of the Work etc. which result in a savings of time to the GC. In such an event, the GC shall not be entitled to receive a time extension until all Owner-caused time savings are exceeded and the contract completion date is also exceeded.
5. Change Orders and Time Extensions: Schedule updates shall include all changes to the contract scope and completion date.
- a. The GC shall anticipate that the Owner may require various changes to the Work. Only those changes which also change the duration of the critical path shall entitle the GC to present a claim for schedule impact and only to the extent of the change in duration to the critical path.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled

- network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. General 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).
- E. 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.
- F. 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.

## 2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  1. List of subcontractors at Project site.
  2. Approximate count of personnel at Project site.
  3. Equipment at Project site.
  4. Material deliveries.
  5. High and low temperatures and general weather conditions.
  6. Accidents.
  7. Meetings and significant decisions.
  8. Unusual events (refer to special reports).
  9. Stoppages, delays, shortages, and losses.
  10. Meter readings and similar recordings.
  11. Emergency procedures.
  12. Orders and requests of authorities having jurisdiction.
  13. Change Orders received and implemented.
  14. Change Directives received and implemented.
  15. Services connected and disconnected.
  16. Equipment or system tests and startups.
  17. Partial Completions and occupancies.
  18. Final Acceptances authorized.
- B. 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 interpretation on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence.

Distribute copies of report to parties affected by the occurrence.

- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by General Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
- C. Progress Reports: As a separate document, the GC shall submit progress report, with each Application for Payment, which shall consist of a checklist showing the date of commencement of each activity on the Construction Schedule then commenced, the date of completion of those activities completed, and the approximate percentage of completion of each activity.

## 2.6 COORDINATION DRAWINGS:

- A. The General Contractor shall organize coordination meetings to develop a set of coordination drawings with all contractors (Electrical, Mechanical, Plumbing, Fire Protection, IT/Data, and general building trades). Any relocation of system routings shall be identified and addressed on the coordination phase by each of the contractors. These drawings, when completed, shall be signed off by all of the above-listed parties. Complete coordination drawings shall be completed prior to fabrication and installation of the associated trades respective systems, and purchase of equipment. The following items represent the minimum requirements of the coordination drawings:
  - 1. All coordination drawings will be produced at 1/4" – 1"-0" scale.
  - 2. Coordination drawings will be distributed on reproducible material 30" x 42".
  - 3. Coordination drawings are not shop drawings and are required in addition to shop drawings.
  - 4. Once the complete coordination drawings have been compiled, the GC will distribute one signed set of each to the following: Mechanical, Electrical, Plumbing, Fire Protection, and general trades. Additional sets will be sent to the Owner, Architect and Engineer.
- B. The use of Building Information Modeling (BIM) throughout the construction process is a requirement for this project to help reduce or eliminate field detected conflicts, improve construction quality and maintain an aggressive schedule. The GC will be responsible for creating the model and managing the coordination and collision detection process. The model must contain complete architectural, structural, mechanical, electrical, plumbing and fire protection systems consistent with the design and fabrication drawings.
- C. Copies of completed coordination drawings shall be forwarded to the Architect, for information only, and not as shop drawings, prior to the installation of the work.

- D. Work installed in advance of the completion of the coordination drawing process which must be relocated to effect coordination, shall be relocated as part of the work. Such relocation shall not be basis of entitlement for additional time or money.
- E. The process of coordination may require the addition of sleeves and reinforced penetrations not specifically shown by the documents. Such sleeves and reinforced penetrations of the structure are a part of the work and shall be provided by the contractor needing the sleeve or penetration. Penetrations through concrete shall be effected by forms or sleeves. Penetrations shall not be cored, drilled or chopped through structural elements unless specifically engineered by the General Contractor and submitted for review in accordance with procedures for submittal of shop drawings. Penetrations through structural steel members shall be reinforced with pipe sleeves full penetration welded to the webs or flanges of the members or shall be fully reinforced with plates, shapes, and angles. Reinforcement details for penetrations through structural steel will be provided by the structural engineer upon request by the GC.
- F. The GC shall conduct all necessary coordination meetings with the sub-contractors to fully and effectively attain this coordination and to develop these coordination drawings.
- G. Coordination drawings shall be revised, to reflect as-built conditions, by the GC, and shall be given to the Owner at the time of request for Final Inspection.

## PART 3 – EXECUTION

### 3.1 GENERAL CONTRACTOR’S CONSTRUCTION SCHEDULE

- A. General Contractor’s Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. The submittal of a fully-revised and acceptable construction schedule shall be a condition of the processing of the second monthly payment application. As such, each of the Prime subcontractors has a specific obligation to each of the other Prime sub-contractors to provide all necessary information and to fully cooperate with the GC in the development of this and all other construction schedules including monthly updated schedules. All updated construction schedules shall include an updated submittal schedule excerpted from the construction schedule.
  - 2. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting. The GC shall include the Project Manager’s signature on each updated schedule which shall indicate that all sub-contractors have reviewed and approved said schedule update. Receipt by the Designer and Owner of signed, updated schedules shall be a condition of approval of each monthly application for payment.
  - 3. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations. The GC shall receive the permission of the Owner to make changes to the schedule. Notwithstanding any other provisions herein to the contrary, the time of completion may be extended only by a written change order. The GC shall advise in advance, at least 24 hours on weekdays and at least 48 hours on weekends and holidays, of all schedule changes so

that any Owner inspections can be arranged.

- . As the Work progresses, indicate Actual Completion percentage for each activity.
- 4. 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.
  - a. If completion of any part of the work, the delivery of equipment or materials, or submittal of any of the submittals is behind the updated construction schedule and will impact the end date of the work past the contract completion date, the General Contractor, shall submit in writing, a plan acceptable to the owner for completing the work on or before the current completion date.
  - b. No extensions of time shall be granted unless the delay can be clearly demonstrated by the General Contractor, on the basis of the updated construction schedule current as of the month the change is issued on the delay occurred and which delay cannot be mitigated, offset, or eliminated through such actions as revising the intended sequence of work or other means. It is recognized that any such delay which is the direct result of, and only the direct result of an owner directed change may entitle the General Contractor to added compensation for efforts to maintain the schedule or for costs related to extending the schedule as a result of the owner directed change which cannot be accommodated by owner caused time savings.
- 5. As a precedent to the release of retained funds, the General Contractor shall, after completion of the work has been achieved, submit a final construction schedule which accurately reflects the manner in which the project was constructed and includes actual start and completion dates for all work activities on the construction schedule.
- 6. Should the GC fail or refuse to complete any portion of the work in accordance with the Construction Schedule, the Owner may perform or cause to be performed the work necessary to cause such completion, and all costs incurred by Owner and Designer shall be deducted from any monies which otherwise may become due the GC. Should such costs exceed monies due, the General Contractor shall reimburse the Owner within 30 days of the Owner documenting the costs to the GC. Schedule shall be prepared by a third party scheduling consultant.
- 7. The purpose of the Construction Schedule, and monthly updates as hereinbefore described, or as may be otherwise submitted and approved, shall be to furnish the Owner and Designer with information to indicate that the GC has planned the Project in sufficient detail for the GC to insure that its construction can be accomplished in an orderly manner and on the Contract completion date. The dollar value estimates to be included on the schedule are to assist the Owner in cash flow planning so that funds will be readily available to pay the Applications for Payment. Monthly progress reports and updates are to furnish the Owner with current status of any changes required in the original schedule which will assist the Owner in scheduling delivery and installation of any products, furnishings, etc., necessary for the operation of the facility for its intended purpose. The responsibility for construction

planning and the effective efficient implementation of such, or the converse, to meet the Contract completion date, or authorized appropriate extensions therefore, are the total responsibility of the General Contractor, and such responsibility shall not transfer to the Owner/Designer. Preview of the original Construction Schedule, and subsequent modifications thereto, by the Owner and/or the Designer shall be limited to the general purposes set out above. Such approval shall not operate to imply the agreement of the Owner/Designer to the General Contractor's planned procedures, coordination, critical path scheduling, etc., as being appropriate or reasonable.

8. General Contractor shall assign manpower loading for each activity of the schedule by applying the total man-hours required to complete each activity to a resource identified as "man-hours" on each activity."
  9. If the General Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the General Contractor and sub-contractor. The General Contractor shall use average composite crews to display the labor loading of on-site construction activities. The General Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable."
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by General 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 01 32 00

## SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final completion construction photographs.
  - 4. Time-lapse sequence construction videotapes.
- B. Related Sections:
  - 1. Division 01 Section "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
  - 2. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.2 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
  - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
  - 2. Format: Minimum 1600 by 1200 pixels, 400 dpi minimum, in unaltered original files, with same aspect ratio as the sensor, uncropped, date- and time- stamped, in folder named by date of photograph, accompanied by key plan file.
  - 3. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name of Architect.
    - c. Name of GC.
    - d. Date photograph was taken.
    - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - f. Unique sequential identifier.
  - 4. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

## PART 2 - PRODUCTS

### 2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 1600 by 1200 pixels and 400 dpi.

## PART 3 - EXECUTION

### 3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.
  - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and General Contractor.
- C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take 8 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take 8 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 12 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Time-Lapse Sequence Construction Photographs: Take 5 color digital photographs as indicated, to show status of construction and progress since last photographs were taken.
  - 1. Frequency: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment.

2. Vantage Points: Following suggestions by Owner, Architect and GC, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse sequence as follows:
3. Revise phase descriptions in subparagraphs below to suit Project.
  - a. Commencement of the Work, through completion of subgrade construction.
  - b. Above-grade structural framing.
  - c. Exterior building enclosure.
  - d. Interior Work, through date of Final Acceptance.

END OF SECTION 01 32 33



## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 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 "Construction Progress Documentation" for submitting schedules and reports, including GC's Construction Schedule and the Submittals Schedule.
  - 2. Division 1 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
  - 3. Division 01 Section "Closeout Procedures" for submitting warranties.
  - 4. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 5. Division 01 Section "Sustainable Design Requirements" for submitting sustainable and Green Globes-related documentation
  - 6. Divisions 03 through 33 Sections for specific requirements for submittals in those Sections.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.

#### 1.3 SUBMITAL REQUIREMENTS

- A. In addition to the requirements in Article 5 of the General Conditions, General Contractor shall provide the following:
  - 1. The submittal schedule shall be an excerpt from the CPM schedule described herein. This Schedule shall indicate the items, relevant specification sections, other related submittals, the date when such item will be furnished to the Architect, and the date by which Architect's review is necessary to maintain Construction Schedule. This schedule shall take into consideration the resubmission of shop drawings required to achieve acceptance of the Designer and Owner.
- B. The following shop drawings will take longer than 20 calendar days for review and return to the GC:
  - 1. Structural Steel.
  - 2. Structural Studs
  - 3. Mechanical Systems.

4. Final finish samples.

- C. All shop drawings, submittals, samples, and data shall be submitted to the Designer for review according to accepted CPM schedule from Article 5 (a) of the General Conditions of the Contract. After these items have been reviewed by the Designer they will be returned to the General Contractor for distribution. Samples and shop drawings required for evaluation of a substitution shall be submitted with the request for substitution. Shop drawings, submittals, samples, and data will not be considered by the Designer unless the submission clearly indicates that they have been checked, coordinated between Prime Subcontractors, and stamped approved by the General Contractor and Fabricator or General Contractor, Subcontractor, and Fabricator as the case may be. All shop drawings and catalog cuts submitted shall each receive the pre-approved stamp completed and dated by the General Contractor and submitting sub-contractor. Samples shall have the stamp affixed to a tag attached to each sample.
- E. No extension of construction time will be allowed for delay in checking shop drawings, submittals, samples or data because of the General Contractor's, Subcontractor's, or Fabricator's failure to check shop drawings before submitting them to the Designer. All shop drawings shall be prepared to show how the material relates specifically to the conditions of the Project. Standard manufacturer's drawings that do not show how and where the material is to be used will not be considered. Shop drawings shall not be reproductions or portions of reproductions of the Contract documents. Coordinated shop drawings at the same scale indicating all mechanical, electrical, and plumbing shall be required between all trades. The dominant Prime Subcontractor in a given area, as determined by the General Contractor, shall submit its drawings to the other involved Subcontractors through the General Contractor.
- F. The GC will furnish and deliver to the Owner 1 copy of each shop drawing, submittal, sample, and data which has been reviewed by the Designer and which has received an "APPROVED" or "APPROVED AS NOTED" evaluation. The GC shall deliver these to the Owner within 14 calendar days of receiving each reviewed item from the Contractor following review by the Designer, or in the case where 1 copy of a sample was submitted, within 14 calendar days of receiving advice that the sample is "APPROVED" or "APPROVED AS NOTED". Coordinate delivery with the owner's project manager. The owner shall have the option of accepting submittal copies during construction or at closeout in which case the General Contractor shall neatly store all items by division in "banker type" storage boxes or a separate file cabinet in the General Contractor's office facility. All stored submittals and samples shall be accessible to owner at any time during normal working hours.
- G. After the Electrical, HVAC, and Plumbing shop drawing submittals have received a favorable review, the General Contractor shall submit to the Designer for the Owner, complete operating and maintenance manuals as called for in Divisions 1, 22, 23, 26, 27 and 28. These manuals shall be submitted not later than 14 calendar days before occupancy.
- H. Only Contract Documents, approved Change Orders, approved submittals to the extent they are in accordance with the Contract Documents, Designer bulletin drawings, and references specifically incorporated into Contract Documents constitute authoritative description of the Work. No other documents, including GC or sub-contractor generated drawings, shall be considered authoritative.

## 1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for GC's use in preparing submittals according to Par.1.5 herein.
  - 1. The Architect will provide floor plans only for use in preparation of coordination drawings and submittals. Under no circumstance will details, sections or other parts of the contract documents be reproduced for the purpose of shop drawings and coordination drawings.
- 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. Where products or systems of one contractor abut, connect to or otherwise come in contact with those of another contractor, the GC shall coordinate submittals for any and all details that clearly demonstrate said interaction. Such coordination shall also clearly demonstrate under which warranty the interaction of different contractors, systems, products etc. shall fall.
  - 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. Architect 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 1 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 Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 20 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise GC when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow 20 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 Architect and General

Contractor.

3. Include the following information on label for processing and recording action taken:
  - a. Project name.
  - b. Date.
  - c. Name and address of Architect and General Contractor.
  - 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 for each required submittal identified in each specification section (e.g., 06 10 00.01 - Product Data; 06 10 00.02 - Shop Drawings etc.). Resubmittals shall be identified exactly as original submittal with an appropriate revision number (e.g. 06 10 00.01R1)**
  - i. Drawing number and detail references, as appropriate.
  - j. Location(s) where product is to be installed, as appropriate.
  - k. Other necessary identification.
- F. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals. Unidentified deviations shall not be permitted to be used as justification for deficiencies discovered after approval of shop drawings.
- G. Transmittal: Package electronic files for each submittal individually. Each submittal shall include the contractor's transmittal and shall be packaged as a single file. Submittals received with separate or detached files will be returned without review. Bundle all required submittals from each individual specification section together as a single package with bookmarks. Provide separate identifier numbers for each individual element of each bundled package (i.e. identify product data, shop drawings etc. as separate sub-items within a specification section submittal package. Incomplete packages or packages missing required submittals shall be returned without review. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than GC.
  1. Transmittal Form: Use form approved by the Architect.
  2. On an attached separate sheet, prepared on GC's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked "APPROVED" or "APPROVED AS NOTED"
    - a. All subsequent reviews after the second re-submittal will constitute an additional service by the Designer and shall be payable to the Designer by the GC via a

deductive Change Order to the Owner/GC Agreement on an hourly plus reimbursable expenses basis

- I. 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.
- J. Use for Construction: Use only final submittals with mark indicating approval by Architect as specified in 1.3.H.3 above.
- K. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes non-compliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  - 1. Architect will send required submittals to concurrent reviewer (Commissioning Agent) and will return submittals with comments from both A/E and CxA.

## 1.5 REQUEST FOR COPIES OF DRAWINGS

- A. Electronic copies of the Architectural drawings may be provided to the GC upon receipt of a signed release.
  - 1. Electronic drawing copies for Civil, Structural, MEP and Landscaping Designers of Record are subject to each consultant's policy for distribution or may not be available to the Contractor.
  - 2. The documents, including those in electronic form, prepared by the Architect or the Architect's consultants are Instruments of Service through which the Work to be executed by the GC is described. The GC nor any Subcontractor, Sub-subcontractor, material or equipment supplier shall own or claim a copyright in the documents prepared by the Architect or the Architect's consultants and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. Copies, including those in electronic form, furnished to the GC are for use solely with respect to this Project and shall not be used on other projects or for additions to this Project outside the scope of Work. The GC, Subcontractor, Sub-subcontractor, material or equipment supplier are authorized to use and reproduce applicable portions of the documents appropriate to and for use in the execution of their Work under the Contract Documents.
  - 3. The GC, Subcontractor, Sub-subcontractor, material or equipment supplier shall not submit all or portions of the Contract Documents for Shop Drawings. All Shop Drawings must be prepared specifically for this project by the appropriate Subcontractor, Sub-subcontractor, material or equipment supplier. Documents, including those in electronic form supplied by the Architect or the Architect's consultants may only be use in the preparation of Shop Drawings as background information.
  - 4. Electronic files are not Construction Documents. Significant differences may exist between the electronic files and the Construction Documents. The Architect and the Architect's consultants disclaim and make no representations, or warranties, expressed or implied, as to the merchantability, condition, accuracy, use, fitness for a particular purpose, suitability, durability of the information or the medium in or on which the information is furnished, of

the transferred electronic information. The Architect and the Architect's consultants shall not be liable for any damages, use of the electronic files is at the sole risk of the GC, Subcontractor, Sub-subcontractor, material or equipment supplier. The GC, Subcontractor, Sub-subcontractor, material or equipment supplier, by use of electronic files, shall not be relieved of their duty to fully comply with the Contract Documents, including without limitation, the need to check, confirm and coordinate their work.

5. For the purpose of the contractor's coordination drawings, the only drawings that will be provided for use by the contractor are architectural floor plan and reflected ceiling background drawings. Under no circumstance, will plumbing, mechanical, fire protection or electrical drawings be provided in an electronic format for use in the development of the contractor's coordination drawings.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
  1. All submittals shall be submitted electronically in PDF format and through the Architect's Sharefile site. The Architect shall provide login information and technical assistance with the Sharefile site to the GC's personnel. Access to the Architect's Sharefile site shall not be provided to any subcontractor and submittals other than physical samples sent via any means other than Sharefile shall neither be acknowledged as received nor will they be reviewed.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Include Division 01 "Sustainable Product Form" with each product covered by the Division 01 "Sustainable Design Requirements" section
  3. Mark each copy of each submittal to show which products and options are applicable.
  4. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Do NOT submit manufacturer's product guide specifications as product data.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operation and maintenance manuals.
    - k. Compliance with specified referenced standards.
    - l. Testing by recognized testing agency.
    - m. Application of testing agency labels and seals.
    - n. Notation of coordination requirements.

**DO NOT SUBMIT MSDS SHEETS TO THE ARCHITECT. SUBMITTALS CONTAINING MSDS SHEETS WILL BE DISCARDED WITHOUT REVIEW. PROVIDE MSDS ONLY FOR CLOSEOUT DOCUMENTS AND OWNER'S INFORMATION.**

5. Submit Product Data before or concurrent with Samples.
  6. Number of Copies: Contractor shall submit product data as follows:
    - a. One electronic copy in PDF format to Architect.
    - b. Architect will return electronic copy with redlines and disposition to GC.
      - 1) GC shall provide and distribute copies of submittals to sub-contractors from returned electronic copy.
      - 2) GC shall print and provide one hard copy of all approved shop drawings and submit to Owner for record purposes.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
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. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
    - m. Relationship to adjoining construction clearly indicated.
    - n. Seal and signature of professional engineer if specified.
    - o. 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 30 by 40 inches.
  3. Number of Copies: Contractor shall submit shop drawings as follows:
    - a. One electronic copy in PDF format to Architect.
    - b. Architect will return redlines and disposition to GC.
      - 1) GC shall provide and distribute copies of submittals to sub-contractors from returned electronic copy.
      - 2) GC shall print and provide one hard copy of all approved shop drawings and submit to Owner for record purposes.
  4. Delegated Design: Where specification sections require signed and sealed shop drawings and/or supporting calculation data by a qualified third party design professional,

Architect's review shall be for conformance with design intent only and shall not be interpreted as approval of third party professional's design or calculations. Architect will not stamp such delegated design submittals but will only indicate that the submittal has been reviewed for information only.

- a. Upon return receipt of delegated design submittals back from the designer of record with comments, GC shall submit one copy to NCSCO for review.
    - 1) In the case of small drawing sets or file sizes, the delegated design submittal may be sent to NCSCO electronically. Larger files or full-sized drawing sets may be required to be sent in hard copy. GC shall coordinate with NCSCO for requirements.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of GC.
  4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through General Contractor, will return submittal with options selected.
  5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit one set of Samples. Architect will retain sample set and will present all selected samples to the Owner for approval for use on the project.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication



- techniques, connections, operation, and other similar characteristics are to be demonstrated.
- 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
  - b. With the exception of some long lead items and at the discretion of the Architect and Owner, all interior finish samples must be submitted prior to release of any final finish selections. The Architect will issue an Architect's Supplemental Instruction with all final finish selections upon receipt, approval and presentation to the Owner of all finish samples. The GC shall allow time in the schedule for this selection process.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
  2. Number and name of room or space.
  3. Location within room or space.
  4. Submit product schedule or list, electronically in PDF format unless otherwise indicated. Architect will return electronically.
    - a. Mark up and returned copy as a Project Record Document.
- F. 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. Architect will return two copies.
    - a. Mark up and retain one returned copy as a Project Record Document.

## 2.2 INFORMATION SUBMITTALS

- A. When the following are specified in individual sections, submit them for information only:
1. Design data
  2. Certificates
  3. Test Reports
  4. Inspection Reports
  5. Manufacturer's instructions

6. Manufacturer's field reports
7. Other types indicated.
8. Installer qualifications.

## PART 3 - EXECUTION

### 3.1 GC'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 Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of GC's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents. GC submittal stamps with a disposition of "Reviewed" are not acceptable.
  1. The GC's submittal approval stamp shall include the following statement: "I hereby certify that all material(s) and equipment shown and marked in this submittal and proposed to be incorporated into the Work is (are) in strict conformance with the Contract Documents, can be installed in the allocated spaces and comprise(s) no variation thereto, unless specifically noted otherwise." Stamp shall include space for GC's signature and date of approval.

### 3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear GC's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
  1. Approved
  2. Approved as Noted
  3. Revise and Resubmit
  4. Rejected
  5. Submit Specified Item Only
- C. Partial submittals are not acceptable except as a resubmittal and in response to Architect's direction to only resubmit specific items. Initial submittals of any given Section that are not complete will be considered nonresponsive, and will be returned without review.
- D. Submittals not required by the Contract Documents will not be reviewed and will be discarded.

END OF SECTION 01 33 00

## SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve GC 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. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit GC's other quality-assurance and-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for GC to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Divisions 03 through 33 Sections for specific test and inspection requirements.

#### 1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- 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, inspections, or both. Testing laboratory shall mean the same as testing agency.
- G. Installer/Applicator/Erector: GC or another entity engaged by GC as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

### 1.3 CONFLICTING REQUIREMENTS

- A. General: 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 uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding. The Architect shall be the authority for determining the highest quality specification. Should the specifications and drawings fail to particularly describe the material or kind of goods to be used in any place, then it shall be the duty of the Contractor to make inquiry of the Architect for what is best suited. The material that would normally be used in this place to produce first quality finished work shall be considered as part of the Contract.
- C. If, in the opinion of the GC work is indicated or is specified in such manner as will make it impossible to produce a first-class piece of work, or should discrepancies appear within the Contract Documents, he shall refer same to the Designer for interpretation before proceeding with work. If the GC fails to make such reference, no excuse will thereafter be entertained for failure to carry out work in satisfactory manner. Where only part of the work is indicated, similar parts shall be considered repetition. Where any detail is shown and the components therefore are fully described, similar details shall be construed to require equal materials and construction.

### 1.4 SUBMITTALS

- A. The GC shall furnish for review by the designer, not later than 20 days after receipt of Notice to Proceed, the GC Quality Control (CQC) Plan proposed to implement the requirements of the Contract. The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The owner will consider an interim plan for the first 20 days of operation. The first application for payment will be processed only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to

begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started. The second application for payment will not be processed until acceptance of the contractors CQC Plan.

- B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Reports: Prepare and submit certified written reports that 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.
- D. 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.

## 1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. 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 products that are similar to those indicated for this Project in material, design, and extent.

- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; 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.
- G. 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.

## 1.6 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 GC with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  - 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to GC, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to Owner are GC's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of GC by authorities having jurisdiction, whether specified or not.
  - 1. Where services are indicated as GC's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. GC shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as GC's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by GC and not required by the Contract Documents are GC's responsibility.
  - 5. 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 1 Section "Submittal Procedures."
- D. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Architect and GC in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and GC 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 GC.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.



- H. General Contractor Responsibilities: The GC is ultimately responsible for quality control and shall establish and maintain an effective quality control system. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the owner, and shall be responsible for all construction and construction-related activities at the site.

## 1.7 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, 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 Architect and General 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 Architect with copy to General Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Project Acceptance, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retesting and 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 Architect.

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 Architect's reference during normal working hours.

### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are GC's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

## SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Temporary Controls: Barriers and fencing.
- B. Stairs, ramps, scaffolding and ramps.
- C. Vehicular access and parking.
- D. Waste removal facilities and services.
- E. Project identification sign.
- F. Field offices.
- G. Toilet facilities

#### 1.2 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades required by for public rights-of-way.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### 1.3 FENCING

- A. The General Contractor shall provide a suitable construction fence around work area within contract limits, located so as to permit sufficient area for storage of materials and conduct of work by all trades.
  - 1. The GC shall coordinate with the Contractors for the Moore Building Abatement scheduled to be completed prior to Demolition and to assume responsibility and contractual rental obligations for construction fence currently in use for both the Abatement and Demolition phase. GC shall modify fence and associated installations as needed to comply with requirements indicated in the Contact Documents for this project.
- B. Materials and methods of fence construction shall be adequate to provide for the safety and security of the project site and shall be the General Contractor's responsibility to select; however as a minimum standard, fence shall be chain link type, minimum six feet high, consisting of 9 gauge wire fabric supported on posts set firmly in the ground at 10 feet o.c.

minimum and a top rail. Provide gates as required. The University will provide the General Contractor with a gate lock and keys for the site fence. No barbed wire will be permitted.

- C. Screening: Provide screening over all chain link fencing as approved by the Architect and the University.
- D. Remove and relocate fence when it interferes with the work of any trade.
- E. Keep gates closed at all times and locked during non-working hours. Owner shall be given copy of key to gate.

#### 1.4 WATER CONTROL AND USAGE

- A. The General Contractor or each subcontractor, as the case may be, shall provide water control for all work performed under the contract. Furnish all labor and necessary equipment and provide all necessary products for the temporary control of surface water and seepage water during construction. Furnish and operate pumps and other equipment required to keep all excavations, pits, and trenches free from water at all times. Dikes and ditches shall be constructed around excavations and elsewhere as necessary to prevent surface water from flooding the excavations or standing in areas adjacent to excavations, in work areas or in product storage areas. The GC shall take all necessary precautions to protect adjacent areas and properties from damage. He shall not divert water onto adjacent areas and properties at points other than that which would be considered the natural flow, prior to construction, without the expressed consent of the Owner in writing with a copy to Architect. He shall take steps to prevent the erosion of soil, earth and other material and the conduction of the eroded materials onto adjacent properties, and shall be responsible for the removal of such materials, the restoration of adjacent areas to their original condition, and at the proper time, the removal of all water control means and methods.
- B. Water Service: The Owner shall pay for water service use charges for water used by all entities for construction operations.

#### 1.5 STAIRS, RAMPS, SCAFFOLDING AND HOISTS

- A. Each subcontractor shall provide and maintain temporary scaffolding, ramps, and runways as required.
- B. Hoisting of materials and equipment shall be provided by the contractor requiring such hoisting.
- C. All apparatus, equipment, and construction included in this article shall be in accordance with all applicable state and local laws.
- D. The GC shall provide roof protection as necessary where scaffolds and chutes are used.

#### 1.6 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.

- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide temporary parking areas to accommodate construction personnel. When site parking is not available, contractor employees will park vehicles in parking lots designated by Western Carolina University.
- D. The GC shall coordinate with WCU on parking requirements.
- E. The cost of parking for all construction vehicles is the responsibility of the contractor(s).

#### 1.7 TREE AND PLANT PROTECTION

- A. GC and sub-contractors are hereby reminded and cautioned that care shall be exercised to protect trees and plants, which are to remain during the progress of the Project. Suitable barriers shall be provided around all trees and plants that are to remain and which are in the construction area and product handling area. All damage to such trees and plants shall be repaired; broken limbs properly and neatly pruned and painted with pruning paint; all trunk damage neatly dressed and painted with pruning paint. Any trees and plants which are excessively damaged shall be replaced in like, kind, size, and species by the GC at no additional cost. All work shall be by a recognized and approved nursery.
- B. All grading around trees and plants to remain shall be such that the root system shall not be disturbed. Earth shall not be temporarily piled around trees and plants, nor shall earth be graded to the trees and plants above the natural root depth for that particular species.
- C. Established trees and plants, which are in the way of construction and which are in the material handling areas, shall be removed and stored for future replanting. The services of a recognized and approved nursery shall be employed to remove the trees and plants and prepare them for storage. Removed trees and plants shall be properly balled and burlapped in accordance with their size. During the time of storage, they shall be properly watered and cared for in accordance with the instructions from the nursery. After the construction work is completed, the stored trees and plants shall be replanted, and those trees and plants not replanted shall be disposed of as directed by the Owner.

#### 1.8 ACCESS ROADS AND PARKING AREAS

- A. The GC shall provide and maintain for the duration of the Contract, a graded and graveled site access road within the boundaries of construction limits for the use of himself, his subcontractors, his product suppliers as the case may be. Additional access ways shall be furnished and maintained to the product storage areas and the work itself. All access roads and ways shall be properly maintained for passage during all weather conditions while work is being performed.
- B. Additional access roads and parking areas shall be furnished and maintained during all weather conditions for the use of the Owner, Owner's visitors, and other persons and services having proper business at the Project until permanent roads and parking areas are provided.
- C. Should access roads not be located for permanent roads, they shall be removed, prepared for

grassing, and grassed. Otherwise, they shall be prepared for permanent roads.

- D. Coordinate access and haul routes with governing authorities and Owner.
- E. Provide and maintain access to fire hydrants, free of obstructions.
- F. The GC shall be responsible for keeping streets and surrounding sidewalks free from mud, dirt and debris at all times and shall remove the aforementioned from streets and sidewalks daily or as often as necessary to keep streets clean. If the GC fails to keep streets clean and clear, the Owner may remove mud, dirt and debris or have it removed. The cost of this removal may be deducted from any amounts due or to become due to the GC.
- G. Provide and maintain temporary sidewalks, fences, or other structures required by law so as to not obstruct or interfere with traffic in public streets, walkways or private right-of-way. Leave an unobstructed way along public and private places for pedestrians and vehicles.
- H. Provide emergency egress from existing occupied areas at all times as required by authorities having jurisdiction. Maintain egress path in compliance with requirements of North Carolina State Building Code requirements.

#### 1.9 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Remove trash from site periodically.

#### 1.10 PROJECT IDENTIFICATION

- A. A shop drawing of the project identification sign must be approved by the University prior to fabrication. No directional signs will be permitted without the University's permission. Contractors are not permitted to install any sign, anywhere on the site, off the site on University property, or on any equipment on the site, without explicit written approval of the Owner. See enclosed University project sign detail.
- B. Location of any sign shall be approved by the Owner. Should any sign be moved from its initial location, the new location shall be approved by the Owner. All signs shall be maintained by the project expeditor in first class condition throughout the Contract by repainting, repairing, and re-erecting as necessary and as required. Sign shall be fabricated as indicated on the Drawings.

#### 1.11 FIELD OFFICE AND SHEDS

- A. Location of all temporary offices and storage sheds shall be approved by the Architect and owner.
- B. Storage Sheds shall be provided and maintained by the GC and/or subcontractors in accordance with the requirements of the Contract Documents. Open trailers and flat beds for materials

storage are prohibited unless authorized in writing by the Owner.

- C. General Contractor's Field Office: The GC shall provide and maintain, as part of the Contract, a weathertight and secure office for his daily use and for meeting space. Office shall have lighting, electrical outlets, telephone and facsimile machine, heating, cooling and be equipped with sturdy furniture, drawing rack and drawing display table. Office shall have an illuminated and ventilated toilet room containing 1 water closet, 1 lavatory with mirror and a supply of toilet tissue, paper towels and liquid hand soap. The office shall be large enough for the GC's own use and for use as a coordination office to include meeting space with tables and chairs for 12 people. All utilities, supplies, cleaning, and maintenance shall be by the GC as part of the Work and at no additional cost. Provide telephone service as called for hereinbefore. All temporary offices and conference areas shall be smoke free.

#### 1.12 FIRST AID KITS

- A. General Contractor and each Prime Subcontractor shall provide adequate provisioned first aid kits on the Project site for personnel employed by him and for the convenience of workmen employed by their Sub-subcontractors.

#### 1.13 TOILET FACILITIES

- A. 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.

#### 1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Final Acceptance.
- B. Remove underground installations to a minimum depth of 2 feet.
- C. Clean and repair damage caused by installation or use of temporary work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 50 00

## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
  - 1. Division 01 Section "Alternates" for products selected under an alternate.
  - 2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
  - 3. Divisions 03 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.
- C. Related Requirements
  - 1. Section 01 40 00 - Quality Requirements: Product quality monitoring.

#### 1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
    - a. The use of a particular manufacturer's name in connection with materials to be furnished and installed on this project shall be construed to be for descriptive rather than restrictive purposes. However, product selections must comply with other requirements of these documents and the use of unspecified products without proper documentation to and prior approval from the Architect is strictly prohibited.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
  - 4. "Equal To" or "Approved Equal": Substitute products by manufacturers other than those specified in the Project Manual, Addenda and on the drawings which may be incorporated in the Work after review and concurrence by the Architect and acceptance by the Owner. This review shall be in accordance with the General Requirements.



- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
  - 1. Where Basis of Design product(s) are included in individual Sections, other named manufacturer's products are only acceptable where they, at the Architect's sole discretion, meet the technical specification requirements of the Basis of Design product AND the design intent for aesthetics, function, durability etc. No additional cost will be accepted to provide the named Basis of Design product where other named manufacturers' products do not fully meet the design requirements.

### 1.3 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
  - 1. Coordinate product list with GC's Construction Schedule and the Submittals Schedule.
  - 2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
  - 3. Initial Submittal: Within 14 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
    - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
  - 4. Completed List: Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  - 5. Architect's Action: Architect will respond in writing to GC within 10 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests prior to Receipt of Bids: Submit in accordance with Article 12 of the

North Carolina Department of Administration State Construction Office Instructions to Bidders,  
Form OC-15GC.

- C. Substitution Requests After Award of Contract (If Allowed by the Architect): Submit electronic copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use Construction Specifications Institute (CSI) 13.1A Form .
  2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Statement from GC certifying that proposed substitution provides Owner with significant benefit in terms of time required for installation, quality of proposed product, cost savings etc. Under no circumstance will the Designer consider substitution requests that require additional cost to the Owner or significant changes to the documents.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    - i. Detailed comparison of GC's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
    - j. GC's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
    - k. GC's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
  3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify GC of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    - a. Form of Acceptance: From Designer in writing only.
    - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- D. Comparable Product Requests (If Allowed by the Architect): Submit electronically for each request for consideration. Identify product or fabrication or installation method to be replaced.

Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify GC of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
  - a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."
  - b. Use product specified if Architect cannot decide on use of a comparable product request within time allocated.
- E. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01. Show compliance with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If GC is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
  1. The GC and each subcontractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve GC, sub-contractors or suppliers of obligations under requirements of the Contract Documents.
  1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
  3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
  1. Made using or containing CFC's or HCFC's.

## 2.2 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- B. Product Selection Procedures:
1. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed.
  2. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, that complies with requirements.
  3. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
  4. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
  5. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.3 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 10 days prior to bid date and time. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider General Contractor's request for substitution when the following conditions are satisfied. Substitution requests submitted by any other entity than GC will not be acknowledged or reviewed. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - 2. Requested substitution does not require extensive revisions to the Contract Documents.
  - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 4. Substitution request is fully documented and properly submitted.
  - 5. Requested substitution will not adversely affect GC's Construction Schedule.
  - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 7. Requested substitution is compatible with other portions of the Work.
  - 8. Requested substitution has been coordinated with other portions of the Work.
  - 9. Requested substitution provides specified warranty.

## 2.4 COMPARABLE PRODUCTS

- A. Timing: Architect will consider requests for substitution of comparable products if received within 10 days prior to bid date and time. Substitution requests submitted by any other entity than GC will not be acknowledged or reviewed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider GC's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects with project names and addresses and

names and addresses of architects and owners, if requested.

5. Samples, if requested.

### PART 3 - EXECUTION - NOT USED

END OF SECTION 01 60 00

## SECTION 01 70 00 - EXECUTION REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Surveying for laying out the work.
- C. General requirements for maintenance service.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- B. Section 01 77 00 - Closeout Procedures: Procedures required for proper closeout.
- C. Section 01 78 00 - Closeout Submittals: Operation and maintenance data, warranties and bonds.
- D. Section 01 78 39 - Project Record Documents: Requirements for submittal of record documents.
- E. Individual Product Specification Sections:
  - 1. Advance notification to other sections of openings required in work of those sections.
  - 2. Limitations on cutting structural members.

#### 1.3 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in North Carolina and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- B. For field engineering employ a professional engineer of the discipline required for specific service on Project, licensed in North Carolina.
- C. All contract and sub-contract work shall be done by personnel normally employed for such work.

#### 1.4 PROJECT CONDITIONS

- A. Dewatering:
  - 1. Prevent surface water and subsurface or ground water from flowing into the excavations and flooding the project site and surrounding area.



2. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey the water away from excavations.
  3. Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside the excavation limits for each structure. Do not use trench excavations for site utilities as temporary drainage ditches.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
  - C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
  - D. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
  - E. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
  - F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

## 1.5 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## PART 2 - PRODUCTS

### 2.1 PATCHING MATERIALS

- A. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Contractor shall examine the site before bidding project and shall familiarize themselves with all existing conditions. Failure of the Contractor to visit the site before submission of a bid shall not relieve him or her of any special problems which might have been avoided had the Contractor examined the existing site conditions.
- B. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- D. Examine and verify specific conditions described in individual specification sections.
- E. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- F. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- G. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions. Under no circumstances shall structural elements be cut, drilled, or otherwise altered without prior approval of the Architect.

### 3.2 PREPARATION

- A. If any part of the Contractor's work is dependent for its proper execution, or for its subsequent efficiency or appearance, on the character or condition of contiguous work not executed by him

or her, then the Contractor shall examine and measure such contiguous work and report to the Designer in writing any imperfection therein, or any condition which renders it unsuitable for the reception of his or her work. In case the Contractor proceeds without making such written report, he or she shall be held to have accepted such work and the existing conditions. Consequently, the Contractor shall be responsible for any defects in his or her work thereon. The Contractor will not be relieved of the obligation of any guarantee because of any such imperfection or condition.

- B. Clean substrate surfaces prior to applying next material or substance.
- C. Seal cracks or openings of substrate prior to applying next material or substance.
- D. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### 3.3 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Survey all new and abandoned underground utilities.
- C. Promptly notify Architect of any discrepancies discovered prior to construction.
- D. GC shall locate and protect survey control and reference points.
- E. Control datum for survey is that established by Owner provided survey.
- F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- G. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- I. Utilize recognized engineering survey practices.
- J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, and floor elevations.
- K. Periodically verify layouts by same means.

- L. Maintain a complete and accurate log of control and survey work as it progresses.

### 3.4 CUTTING AND PATCHING

- A. Any road requiring cutting on the University campus must be coordinated with the owner

### 3.5 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
- E. The construction site, and adjacent campus area, shall be kept free from the accumulation of trash, litter, or debris at all times. Trash cans/dumpsters shall be emptied and the contents removed from campus before they overflow. Removal of litter, rubbish, and debris are to be performed daily by the Contractor. Use of University trash receptacles for such debris is not allowed. The outdoor burning of trash and debris on campus is not allowed either.
- F. The Contractor shall be fully responsible for the containment of mud and debris on the site as well as removal of these from roads and walkways.
- G. Grass and other vegetation on the construction site shall be trimmed or mowed to maintain a neat appearance. Grass inside the construction area should generally be mowed once a week during the growing season.
- H. Debris shall not be allowed to accumulate in corridors or stairways, and as the various stages of construction are completed, the work must be protected to prevent soiling or spotting, particularly with regard to flooring systems. Carpet shall be cleaned and without spots or traffic patterns. Resilient floors shall be cleaned, sealed, properly finished and of a uniform appearance with no streaks or smears.

### 3.6 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections. Protect roofing

and waterproofing installations from subsequent construction operations by covering with minimum ½” rigid insulation board and ½” plywood (OSB or CDX). Roof and waterproofing protection shall cover the surface in the area where subsequent work is being performed as well as staging areas, access routes from roof access locations to the work area etc.

- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. When interior finishes begin, there shall be no smoking or use of tobacco products inside the building.
- E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

### 3.7 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### 3.8 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Final Acceptance or the length of the specified warranty, whichever is longer.
- C. Furnish service and maintenance of components indicated in specification sections during the warranty period.
- D. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- E. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- F. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 70 00

## SECTION 01 73 29 - CUTTING AND PATCHING

### PART 1 GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

#### 1.2 SECTION INCLUDES

- A. This Section includes procedural requirements for cutting and patching.

#### 1.3 RELATED SECTIONS

- A. Refer to Divisions 2 through 32 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
  - 1. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

#### 1.4 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 surfaces to original conditions after installation of other Work.

#### 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
  - 1. Provide a list of additional elements that are structural elements and that require Architect's or General Contractor's approval of a cutting and patching proposal.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 1. Primary operational systems and equipment.
  - 2. Air or smoke barriers.
  - 3. Fire-protection systems.
  - 4. Control systems.

5. Communication systems.
  6. Conveying systems.
  7. Electrical wiring systems.
  8. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
  2. Membranes and flashings.
  3. Exterior curtain-wall construction.
  4. Equipment supports.
  5. Piping, ductwork, vessels, and equipment.
  6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: 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.

## 1.6 WARRANTY

- A. Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void warranties.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.



- B. In-Place Materials: Use materials identical to existing materials (masonry infill in masonry walls and drywall and metal framing in stud walls). For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. In-Place Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  - 5. Proceed with patching after construction operations requiring cutting are complete.

- C. 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 possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION

## SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
  - 1. A minimum of 75% of construction waste, by weight, must be diverted from landfills to alternate sources.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
  - 1. Aluminum and plastic beverage containers.
  - 2. Corrugated cardboard.
  - 3. Wood pallets.
  - 4. Clean dimensional wood: May be used as blocking or furring.
  - 5. Land clearing debris, including brush, branches, logs, and stumps.
  - 6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
  - 7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
  - 8. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
  - 9. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  - 10. Glass.
  - 11. Plastic buckets.
  - 12. Paint.
- E. GC shall submit Waste Disposal Reports monthly with pay application; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- F. The following sources may be useful in developing the Waste Management Plan:

1. State Recycling Department, at the State of North Carolina.
- G. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
  2. Burying on the project site.
  3. Dumping or burying on other property, public or private.
  4. Other illegal dumping or burying.
- H. Regulatory Requirements: GC is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

## 1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.
- F. Western Carolina University Design and Construction Manual

## 1.3 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of

exposure.

- F. **Recyclable:** The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. **Recycle:** To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. **Recycling:** The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. **Return:** To give back reusable items or unused products to vendors for credit.
- J. **Reuse:** To reuse a construction waste material in some manner on the project site.
- K. **Salvage:** To remove a waste material from the project site to another site for resale or reuse by others.
- L. **Sediment:** Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. **Source Separation:** The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. **Toxic:** Poisonous to humans either immediately or after a long period of exposure.
- O. **Trash:** Any product or material unable to be reused, returned, recycled, or salvaged.
- P. **Waste:** Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

#### 1.4 SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures, for submittal procedures.
- B. **Waste Management Plan:** Submit proposed waste management plan for review by Owner. The plan shall include at a minimum:
  - 1. **General:** Provide an overall strategy for managing the demolition and construction debris of the Project.
  - 2. **Waste Identification:** Indicate anticipated types and quantities by weight of demolition, site clearing and construction waste generated by the Project.

3. **Waste Reduction Work Plan:** List each type of waste anticipated and whether it will be salvaged, recycled or disposed of in landfill or incinerator. Include handling and transportation procedures.
  - a. **Salvaged Materials:** For each type of material that is salvaged or recycled, describe the type of material, source, estimated quantity and the receiving entity. Provide contact information for receiving entity.
  - b. **Disposed Materials:** Indicate how and where materials will be disposed. Provide contact information for receiving entity.
  - c. **Handling and Transportation Procedures:** Include methods that will be used for separating recyclable waste and designated location on site where separation procedures will occur.
- C. **Waste Disposal Reports:** Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
  1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
  2. Submit Report on a form acceptable to Owner.
  3. **Landfill Disposal:** Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  4. **Incinerator Disposal:** Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
    - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  5. **Recycled and Salvaged Materials:** Include the following information for each:
    - a. Identification of material, including those retrieved by installer for use on other projects.
    - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
  - a. Identification of material and how it was used in the project.
  - b. Amount, in tons or cubic yards.
  - c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

## PART 2 - PRODUCTS

### 2.1 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
  1. Relative amount of waste produced, compared to specified product.
  2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
  3. Proposed disposal method for waste product.
  4. Markets for recycled waste product.

## PART 3 - EXECUTION

### 3.1 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

### 3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, and Owner.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
  - 1. Pre-bid meeting.
  - 2. Pre-construction meeting.
  - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  - 1. As a minimum, provide:
    - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
    - b. Separate dumpsters for each category of recyclable.
    - c. Recycling bins at worker lunch area.
  - 2. Provide containers as required.
  - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
  - 4. Locate enclosures out of the way of construction traffic.
  - 5. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  - 6. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19



## SECTION 01 77 00 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 3. Final cleaning.
  - 4. Attic Stock Turnover
- B. Related Sections include the following:
  - 1. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 1. Divisions 03 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.2 INITIAL CLOSEOUT PROCEDURES

- A. Advise Owner of pending insurance changeover requirements.
- B. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- C. 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.
- D. Prepare and submit Project As-built Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
- E. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
- F. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
- G. Complete startup testing of systems.
- H. Submit test/adjustment/balance records.
  - 1. All building control work must be complete prior to performing Test and Balance.
  - 2. Control work and Test and Balance must be complete prior to start of commissioning.

- I. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- J. Advise Owner of changeover in heat and other utilities.
- K. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- L. Complete final cleaning requirements, including touchup painting.
- M. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- N. Submit a final Application for Payment according to Division 01 Section "Price and Payment Procedures."
- O. Submit certified copy of Architect's Pre-Final inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
- P. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- Q. Submit pest-control final inspection report and warranty.
  - 1. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

### 1.3 INSPECTION PROCEDURES

- A. General: Prior to requesting any Designer/Owner required inspection, GC shall perform their own inspection.
  - 1. GC shall prepare punch list of items for subcontractor correction and distribute such list to all subs for corrective action.
  - 2. GC shall submit completed and signed off punch lists to Architect along with written request for required designer/Owner inspections. GC shall initial each punch list item verifying completion. Provide Architect and Owner minimum seven days notice to schedule all required inspections.
  - 3. Owner and designer will perform required inspections upon receipt of contractor request for inspection and Contractor's completed punch lists.
  - 4. Designer(s) shall issue punch list of corrective actions required for each design discipline to GC for distribution to subcontractors for corrective action.

5. Upon completion of corrective action, GC shall initial each item on designer's punch lists as verification of satisfactory correction of the item, and submit complete, signed off punch lists to Architect along with written request for verification inspection.
    - a. Contractor must submit Designer's punch list in its original format. Punch lists sorted, manipulated or otherwise created by the Contractor based on the Designer's original list will not be accepted.
  6. Designers will schedule verification inspection for completed punch lists:
    - a. If, in the designer's judgment, the GC has not satisfactorily completed corrective actions or otherwise provided agreeable resolution for ALL punch list items, the Designer will stop the verification inspection, and advise the GC in writing with a brief general description of reasons for stopping inspection.
    - b. The GC shall then take the appropriate corrective actions to make all corrections and re-schedule verification inspection as specified above.
    - c. The designers shall re-schedule the verification inspection upon written request from GC. If, in the designers' judgment, the GC fails again to meet the requirements as outlined herein, the inspection will be stopped.
    - d. All subsequent inspections after the second GC-requested verification inspection will constitute an additional service by the Designer and shall be payable to the Designer by the GC via a deductive Change Order to the Owner/GC Agreement on an hourly plus reimbursable expenses basis.
- B. Required Inspections: All inspections listed below shall follow the inspection procedures as indicated above:
1. Above-ceiling Inspection: Owner and Designers shall perform inspections of all above-ceiling installations prior to close up of ceilings.
    - a. GC shall provide ladders, lifts and all other equipment necessary to provide access to above-ceiling areas for inspection purposes.
    - b. Above-ceiling areas that are determined to be inaccessible for inspection purposes shall be opened up as necessary to provide such access. All costs associated with such work and subsequent repairs will be entirely the GC's responsibility.
  2. Pre-final Inspection: Owner and Designers shall perform pre-final inspections to determine final compliance and completion of all construction prior to Final Acceptance Inspection including, but not limited to, the following:
    - a. All general architectural and PME components and systems.
    - b. All life safety systems including complete Fire Alarm testing as specified in Division 28.
    - c. Emergency generator and associated systems.
  3. Final Inspection for Owner Occupancy:
    - a. Upon completion of Pre-final inspection and verification by the Designer, the Designer shall request Final Inspection for Owner Occupancy with NCSCO.
    - b. The GC and Designer shall cooperate to provide all required applicable documentation from Project Approval Form for Final Inspection for Owner Occupancy prior to Designer request to NCSCO.
    - c. Attendance at Final Inspection for Owner Occupancy shall include Architect, Owner, NCSCO personnel, GC and all major sub-contractors.

- d. GC shall provide all equipment, testing materials and means of access to perform and demonstrate all systems as determined by the Designers and NCSCO to establish Final Acceptance.
- e. Results of completed inspection will form basis of requirements for Final Acceptance.

#### 1.4 ADDITIONAL REQUIREMENTS FOR OWNER OCCUPANCY

- A. Stair and Ramp Survey: Provide a final 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, NC State Accessibility Code and conformance with the Drawings.
- C. Attic Stock Turnover: GC shall collect and inventory all attic stock and extra materials for turn over to the Owner. Compile list of inventory including all quantities on the Attic Stock Summary form included at the end of this Specification section. Submit summary form to Architect and schedule Architect's review and sign-off confirmation of all attic stock. Coordinate final delivery logistics with Owner.

#### 1.5 LIST OF INCOMPLETE ITEMS (GC'S PUNCH LIST)

- A. Preparation: Submit electronically. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by GC that are outside the limits of construction. Use CSI Form 14.1A or other Architect approved form.
  - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of GC.
    - e. Page number.

#### 1.7 ADDITIONAL OWNER GUARANTEE REQUIREMENTS

- A. All guarantees shall include labor and products and shall be designed by the Manufacturer or Subcontractor, as the case may be, and countersigned by the GC. All guarantees shall be in addition to, and not in lieu of, all legislated guarantees. All guarantees shall be addressed to the Owner and delivered to the Designer upon completion of the Project and before or with the submission of Request for Final Payment.
- B. In the event that the Owner considers it impractical, because of unsuitable test conditions, or

some other factors, to execute simultaneous final acceptance of all equipment, portions of the installation may be certified by the Designer for the Owner's final acceptance when that portion of the system is complete and ready for operation. The decision to accept only portions of the Project rests entirely with the Owner and may only be executed by the Owner.

- C. The General Contractor shall also guarantee for a period of 24 months, unless a longer guarantee time is specifically called for in the Specification Sections, that the work covered by this Contract will be watertight and leakproof at every point and in every area affected by this Contract, except where leaks can be attributed to damage by forces beyond his control. He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any work necessary to make the work covered by this Contract watertight. He shall also, at his own expense, repair or replace any other damaged material, finishes, equipment, and furnishings, damaged as a result of this water penetration to return the building to its original accepted condition.
- D. The General Contractor signing a Contract with the Owner, shall obtain and forward to the Owner any and all guarantees issued by the manufacturers specifically for certain products and systems covered under his Contract. In the event the manufacturer does not have a suitable "preprinted" warranty form" to fully cover the guarantee requirements as set forth in the Specification Section, he shall produce a warranty form patterned after those contained hereinafter which shall fully document the guarantee as set forth in the Specification Section.
- E. In addition to the foregoing stipulations, the GC shall comply with all other guarantees referred to in any portion of the Contract Documents, the more stringent requirements governing.
- F. If for any reason the General Contractor cannot guarantee any part of his work using materials or construction methods which have been specified or indicated he shall notify the Designer in typewritten form before Contracts are signed, giving reasons together with the names of products and data or substitution he can guarantee. Should the GC fail to so notify the Designer prior to the Signing of Contract, he will be held to have agreed to guarantee all work specified or indicated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting Pre-final inspection for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - n. Replace parts subject to unusual operating conditions.
    - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
    - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
    - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid

Project of rodents, insects, and other pests. Prepare a report.

- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

## SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Mark-up drawings (As-Built) to be used in developing Record Drawings.
  - 2. Record Site Utility Survey
  - 3. Record Specifications.
  - 4. Record Product Data.
- B. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 2. Divisions 3 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

#### 1.2 SUBMITTALS

- A. As-built Drawings: Comply with the following:
  - 1. Number of Copies: Submit one complete hard-copy set of marked-up as-built drawings, along with digital scan of prints, to be incorporated as Record Drawings by the Designer.
- B. Record Site Utility Survey: Submit digital files through the architect and engineers of record for review of compliance with these specification requirements.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- D. Record Product Data: Submit one copy of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.



## 2.1 AS-BUILT DRAWINGS

1. Provide detailed 3D BIM Revit model developed from laser scanning of all interior spaces within the building after demolition. BIM Revit model shall meet Level of Development (LOD) 350. The delivered model shall be used for design and construction BIM coordination.
- B. Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark As-built 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.
  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. Revisions to electrical circuitry.
    - f. Actual equipment locations.
    - g. Duct size and routing.
    - h. Locations of concealed internal utilities.
    - i. Changes made by Change Order or Field Work Order.
    - j. Changes made following Architect's written orders.
    - k. Details not on the original Contract Drawings.
    - l. Field records for variable and concealed conditions.
    - m. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings completely and accurately.
    - a. Use of loose sheets, separate binders, booklets, etc. as supplementary information for record prints will not be acceptable.
  4. Mark as-built set 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 Field Work Order numbers, alternate numbers, RFI numbers, Change Order numbers, and similar identification, where applicable.
- C. Format: Identify and date each As-built Drawing; include the designation "PROJECT AS-BUILT PRINT" in a prominent location.
1. As-built Drawings: Organize Marked-up as-built drawings into sets similar to the organization of the contract drawings. Bind each set with durable paper cover sheets.

2. Record Digital Scans: Once as-built drawings are finalized, have sets scanned in color as digital PDF multi-page sets and deliver to the architect on DVD or Flash drive.

## 2.2 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.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

## SECTION 02 41 19 - SELECTIVE DEMOLITION AND ALTERATION WORK

### PART 1 GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

#### 1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the selective demolition and alteration work as shown on the drawings and/or specified herein, including but not limited to the following:

1. Alterations, selective demolition and removals as noted on drawings and as required to accommodate new construction.
2. Removal of debris.
3. Protection of existing building and spaces to remain, and shoring of the structure as required for structural integrity and personal safety.
4. Protection of existing curbs and sidewalks.
5. Temporary coverage passageways.
6. Alterations, selective demolition and removals of exterior facade where noted.
7. Patching and refinishing of existing surfaces damaged as a result of this work.
8. Protection.

#### 1.3 QUALITY ASSURANCE

- A. The Contractor shall comply with the requirements of all applicable Federal, State and local safety and health regulations regarding the demolition of structures including ANSI/NFPD 241-Building Construction and Demolition Operations.
- B. The Contractor shall be responsible for any damage to any adjacent structures or buildings to remain.
- C. Qualifications: Qualifications of Contractor for work of this Section shall not be less than ten (10) years of field experience in work of this nature.
- D. Professional Engineering: The Contractor shall retain the services of a Professional Engineer licensed in the State of Georgia, who shall design and supervise installation of all underpinning and shoring.

#### 1.4 RELATED SECTIONS

### SELECTIVE DEMOLITION AND ALTERATION WORK

- A. Alteration and removal requirements for mechanical and electrical work - Mechanical and Electrical Sections.

## 1.5 PRECONSTRUCTION CONFERENCE

- A. Contractor, Architect, Owner and Subcontractor shall convene to discuss the selective demolition scope.

## 1.6 SUBMITTALS

- A. Schedule of Demolition Operations: Submit demolition procedures and operational sequence for Architect's review prior to start of work. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
  - 1. The work of tying in or connecting to operational systems of the building, including electrical, mechanical and security systems.
  - 2. The work of the Owner or any separate Contractor.
  - 3. The structural value or integrity of any element of the project or of adjacent structures.
  - 4. The integrity or effectiveness of weather-exposed and moisture-resistant elements or systems.
  - 5. The efficiency, operational life, maintenance, or safety of operational elements or systems.
- B. Notice of Differing Conditions: Submit a written notification if, during the work of demolition and cutting, conditions are discovered which significantly vary from those shown on the drawings. Do not commence work until approval of Architect.
- C. Shop Drawings: Submit the following prior to starting work:
  - 1. Submit for Architect's information shop drawings indicating location and typical construction details of temporary dustproof and weatherproof partitions.
  - 2. Submit drawings of temporary structural shoring, bracing, framing or support, for the information of the Architect. Such drawings will be reviewed by the Structural Engineer for the effects of such temporary members on the structural elements to remain. These drawings shall include the reason for such temporary members, the location, the direction and magnitude of design reaction forces on existing structure, and details showing how these reaction forces will be applied to the existing structure.
    - a. Shop drawings shall be submitted with the Seal of the P.E. engaged by Contractor; P.E. must be licensed in the State of Georgia.
    - b. The Architect will receive acknowledgment for concepts shown. Such acknowledgments shall be of the concept only and not of actual capacities or structural design and shall not in any way diminish or limit the Contractor's responsibility for the quality and performance of the work and for protecting existing structures and facilities.

## 1.7 SPECIAL PRECAUTION

- A. Hazardous materials may be encountered during demolition operations including asbestos and lead paint; comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

## 1.8 JOB CONDITIONS

### A. Condition of Structure

1. The Contractor for the work of this Section shall be held to have visited the site, examined the premises, determined for himself the existing conditions, character of equipment and facilities needed for the performance of the work, and all matters which may in any way affect the work before submitting a bid.
  - a. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect existing conditions. Such information is included on the assumption that it may be of interest to the Contractor, but the Architect, Owner and their consultants do not assume responsibility for its accuracy or completeness.
  - b. Notify the Architect if, during the course of demolition, conditions are discovered which significantly vary from those shown on the drawings. Do not proceed until authorized by Architect.
2. The Contractor shall accept the condition of the site and structures as found. The Architect and Owner assume no responsibility for condition of site or structures nor the continuation of the condition existing at time of bidding or thereafter.

- B. Areas of building to be demolished or altered will be vacated and discontinued in use prior to the start of the work.

1. Surrounding areas of the building shall remain operational by the Owner.

### C. Partial Removal

1. Salvaged items turned over to Owner include light fixtures, door panels, fresh air units in attic.
2. Items of savable value to the Contractor may be removed from the structure as the work progresses. Salvaged items must be transported from the site as they are removed.
3. Storage of removed items on the site will not be permitted. D. Explosives: The use of explosives will not be permitted.

### E. Traffic

1. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utilities

1. Refer to Division 22 and 26 of the specifications for special requirements concerning utilities and services.
2. Maintain any existing utilities required to remain; keep in service and protect against damage during demolition operations.
3. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.
4. Disconnect and seal any abandoned utilities before starting demolition operations. Coordinate all work with local utility companies having jurisdiction.

1.9 SCHEDULING

- A. Before commencing any alteration or demolition work, submit for review by the Architect, and approval of the Owner, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.
- B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the structures to remain, notify the Architect and the Owner 7 days in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

PART 2 PRODUCTS

Refer to Part 3 - Execution, for Product Requirements

PART 3 EXECUTION

3.1 PROTECTION

- A. Take full precautions to protect workmen, passersby or any other persons from falling debris and other hazards of demolition operations.
- B. Execute demolition work to insure protection of existing portions of building to remain against damages which might occur from falling debris or other cause. Do not interfere with use of adjacent occupied buildings and areas. Maintain free, safe passage to and from occupied adjacent buildings.
- C. Materials Placement: Do not load structure with weight that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.

SELECTIVE DEMOLITION AND ALTERATION WORK

- D. Construction Operations: Do not employ any construction operation, equipment or vehicles that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.
- E. Take precautions to guard against movement, settlement, damage, or collapse of any part of building, sidewalks, adjacent property or street passages; be liable for any such movement, settlement or collapse. If such damage does accidentally occur, Contractor shall repair promptly at no cost to Owner.
- F. Provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the work and property at all times, including Saturdays, Sundays, and holidays.
- G. Be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life and limb.
- H. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.
  - 1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain. The Contractor's Professional Engineer shall advise on bracing, shoring, underpinning, or other structural requirements. The Contractor shall bear all responsibility for prevention of movement or other structural fault.
  - 2. The Contractor shall restore, by repair or otherwise, the portions of structure or their contents altered by the Contractor in furtherance of his underpinning and support operations. Restoration shall be completed to the conditions which existed prior to the start of the work. Any damage caused by inadequate support shall also be restored by the Contractor at no cost to the Owner.
- I. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition and alteration operations, occupants of the building, public and adjacent property. Any damage caused by the Contractor's operations shall be promptly repaired by the Contractor at no cost to the Owner.
- J. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.
- K. Take necessary precautions to prevent dust and dirt from rising. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.
- L. Provide adequate fire protection in accordance with local Fire Department requirements.

- M. Do not close or obstruct walkways, passageways, or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.
- N. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.
- O. Erect temporary covered passageways at street level as required by authorities having jurisdiction.
- P. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.
- Q. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

### 3.2 INSPECTION

- A. Verify that areas of demolition work are protected and temporary dustproof partitions have been installed.
- B. Verify that construction to be removed is not load bearing or has been properly braced, framed or supported.
- C. Inspect existing conditions of the project, including elements subject to damage or to movement during demolition and cutting.
- D. After uncovering work, inspect the conditions affecting the installation or performance of the work.
  - 1. Report differing or questionable conditions to the Architect in writing; do not proceed with the work until the Architect has provided further instructions.

### 3.3 PREPARATION

- A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work
- B. Provide devices and methods to protect other portions of the project from damage.
- C. Pollution Controls
  - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.  
Comply with governing regulations pertaining to environmental protection.
    - a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
  - 2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of the work.



3. Provide drainage for temporary water use.

### 3.4 DEMOLITION AND CUTTING

A. Selectively demolish existing construction in conformance with the drawings and these specifications.

1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surface to receive installation of work by others and patching of finish surfaces.
2. Do all cutting or removal so as to leave neat, true, plumb and square edges, at edges to remain. Use carborundum or diamond saw equipment for cutting masonry, concrete and stone work, where edges or surfaces are to remain.
3. Do not cut or remove construction which might weaken or impair the structural integrity or strength of the structural framing or support systems which are to remain.
4. Demolish and remove materials as shown on the drawings without damage to the remaining parts of the structure or mechanical/electrical/utility systems.
5. Remove materials so as to not impose excessive loads in supporting walls, floors or framing and so as not to damage remaining undemolished portions of the structure.
6. Where portions of structures are to be removed, remaining portions shall be protected from damage and prepared to fit new construction. Damage to portions of structures to remain shall be repaired.
7. Reinforcing steel in existing structures shall be left in place, cleaned and aligned to provide tie with new work.
8. Existing waterproofing systems and flashings shall be carefully exposed and protected to maintain workable conditions of fitting new work with existing construction.
9. Proceed with demolition in a systematic manner.
10. Demolish concrete and masonry in small sections.
11. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.

B. Shoring

1. Design, provide, erect and maintain necessary temporary shoring, bracing, framing, or support where load bearing structural or supporting members are removed or weakened by cuts or openings or are subject to damage from demolition operations, and otherwise as required for safety or to protect finish surfaces from damage.
2. Construction and adequacy of the shoring shall be the entire responsibility of the Contractor. Any damage caused by the inadequacy of the shoring or other support shall be the responsibility of the Contractor to remedy at no additional expense to the Owner.

3. Shoring and bracing shall remain until new structural framing and/or supports are installed. Coordinate operations fully with other trades.
4. Be ready at any time to promptly provide, add to, or strengthen temporary shoring, bracing, or support for existing work, in case existing construction begins to show signs of structural stress.

### 3.5 WORKMANSHIP STANDARDS FOR ALTERATION AND REMOVAL WORK

- A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.
- B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective specification Sections.
- C. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property.
- D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the adjacent buildings.
- E. In general, demolish masonry in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.
- F. Materials to be removed by existing elevators shall be put in enclosed containers.
- G. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.
- H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
- I. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing roofing. Cut and remove insulation and related items. Provide temporary weathertight protection as required until new roofing and flashings are installed. Consult the Owner to ascertain if existing guarantee bonds are in force and execute the work so as not to invalidate such bonds.
- J. Where utilities are removed, relocated or abandoned, cap, valve, plug, or by-pass to make complete and working installation.
- K. Restore existing pipe and duct coverings damaged by work under this Contract to original undamaged condition.
- L. Immediately restore to service and repair any damage caused by Contractor's workmen to existing pipe and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems which are not scheduled for discontinuance or abandonment.
- M. Upon completion of contract, deliver work complete. Damage that may be caused by Contractor or Contractor's workmen to existing structures designated to remain, grounds, and

### SELECTIVE DEMOLITION AND ALTERATION WORK

utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.

- N. Restore finish work of floors, walls, and ceilings remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.
  - O. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surfaces uniform.
  - P. Perform new work and restore and refinish existing work in conformance with applicable requirements of the specifications, except as follows:
    - 1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.
    - 2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.
    - 3. Installation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved and in accordance with approved shop drawings.
  - Q. Materials or items designated to become the property of the Owner shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the Owner.
  - R. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace materials or items damaged in their removal with similar new material.
  - S. The existing building shall not be used as a work shop. Neither shall the furnishings or equipment in any room be used as work benches. Should any damage occur during the progress of the work to any furniture, fixtures, equipment, or appurtenances therein,  
  
such damage shall be repaired, replaced or made good by the Contractor without extra cost to the Owner.
  - T. Where removing existing floor finish and base, remove all adhesive and leave floors and walls smooth and flush, ready to receive new finish.
  - U. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and loose paint before refinishing.
- 3.6 DISPOSAL OF DEMOLISHED MATERIALS
- A. General

1. Remove from the site debris, rubbish and other materials resulting from work of this Section.
  2. Burning of removed materials from demolished structures will not be permitted on the site.
- B. Removal: Transport materials removed from demolished structures and legally dispose of off site. Pay any and all fees associated with disposal work. Leave the site in an orderly condition to the approval of the Architect.
- 3.7 CLEANING UP
- A. Remove debris as the work progresses. Maintain existing premises in a neat and clean condition.

END OF SECTION 02 41 19

**DIVISION 03**

**CONCRETE**



**PART 1: GENERAL****1.01 DESCRIPTION OF WORK**

Extent of formwork is indicated by the concrete structures shown on the drawings. Work shall include (except as specified elsewhere in the Contract Documents) providing formwork and shoring for all cast-in-place concrete; and installation into the formwork, items furnished by others, such as anchors, plates, inserts, frames, nosings, and any other items embedded in concrete.

**1.02 STANDARDS****A. REFERENCES**

Some products and execution are specified in this section by reference to published specifications or standards of the following with respective abbreviations used:

1. American Concrete Institute.....ACI
2. The American Society for Testing and Materials .....ASTM
3. U. S. Products Standards .....PS

**B. STANDARD SPECIFICATIONS AND CODES**

The following Publications of the American Concrete Institute form a part of this Specification:

1. ACI 347-78 "Recommended Practice for Concrete Formwork".
2. ACI 301-72 "Specifications for Structural Concrete".

**PART 2: PRODUCTS****2.01 MATERIALS**

Materials used for formwork shall be selected by the Contractor, subject to approval by the Engineer. All materials shall be high quality and standard for the industry.

## **PART 3: EXECUTION**

### **3.01 FORMWORK DESIGN**

- A. The Contractor shall be responsible for the design of all concrete formwork. Formwork shall be designed in accordance with ACI 347 unless noted. Design, erect, support, brace and maintain formwork so that it will safely support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressure, stresses, lateral stability, and other factors pertinent to safety of structure during construction. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide back-up material at joints as required to prevent leakage and fins.
- C. Formwork for foundation systems may be omitted when workmanship and soil conditions permit accurate excavation and the omission is approved by the Engineer. Provide temporary openings in wall forms, column forms, and other locations necessary to permit inspection and cleanout.
- D. Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be a commercially manufactured type. Non-fabricated wire shall be used. Form ties shall be constructed so that the end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than two diameters or twice the minimum dimensions of the tie from the formed faces of concrete to be permanently exposed to view except that in no case shall this distance be less than 3/4". When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.
- E. At construction joints, contact surface of the form for sheeting for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by

more than one foot. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface. Wood forms for wall openings shall be constructed to facilitate loosening, if necessary, to counteract swelling of the forms. Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check. Formwork shall be so anchored to shores or other supporting surfaces or members that upward or lateral movement of any parts of the formwork system during concrete placement will be prevented. Runways for moving equipment or pump lines shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel. When mudsills are to be placed for supporting concrete forms, a reasonably level and sufficiently compacted surface will be required. Shores shall be plumb within acceptable tolerances.

### **3.02 TOLERANCES**

- A. Unless otherwise specified by the Engineer, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed in Table 4.3.1 of ACI 301-72.
- B. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and bench marks to be used for reference purposes to check tolerances.

### **3.03 PREPARATION OF FORM SURFACES AND FORM COATINGS**

- A. All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and of all other foreign materials before concrete is placed in the forms. Coat form contact surfaces with form-coating compound before reinforcement is placed. Provide form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion or impede the wetting of surfaces to be cured with water or curing compounds. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

### **3.04 REMOVAL OF FORMS**

- A. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations provided surfaces are cured and protected from cold weather as specified in other sections of this specification.

Forms and shoring in the formwork used to support the weight of concrete in beams, slabs and other structural members, shall remain in place until the concrete



has reached the minimum strength specified of 75% of the specified 28-day design strength. Strength of concrete must be verified by concrete test cylinders molded and cured in the field under the same conditions that the concrete represented by these cylinders are cured and/or maturity meters connected to thermo-couples embedded in the concrete. It shall be the responsibility of the concrete technician, employed by the Owner, to inform the General Contractor when the strength of concrete cured in the field has attained the minimum specified strength required for removal of the forms.

Bottom forms of slabs shall not be removed in less time than is indicated below unless otherwise approved by the Engineer.

Above 60° F.	50° F.	40° to 50° F.
8 days	10 days	18 days

When temperature is below 40° F., the shores shall remain in place for an additional time equal to the lower temperature.

- B. When shores and other vertical supports are so arranged that the non-load-carrying form-facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as specified or permitted. Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.

When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

### **3.05 RESHORING**

- A. When reshoring is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is under way, no live load shall be permitted on the new construction.

In no case during reshoring shall concrete in beam, slabs, column or any other structural member be subjected to combined dead and construction loads in excess of the loads permitted by the Engineer for the developed concrete strength at the time of reshoring. Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

### **3.06 INSPECTION**

The Engineer shall always be notified of the pouring schedule in advance and in ample time prior to placement of concrete to inspect the formwork. Inspection of formwork will be made only after each section to be poured is complete.

### **3.07 RECORDS**

- A. The Contractor shall maintain an accurate log showing the following information:
  - 1. Date of pour
  - 2. Area poured
  - 3. Average ambient temperature during curing period
  - 4. Date forms scheduled for removal
  - 5. Date form removal completed
  - 6. Method of reshoring (number of floor, etc.)
  - 7. Test cylinder serial numbers
  - 8. Strength of test cylinders at 7 and 28 days.

### **3.08 QUALITY CONTROL & TESTING**

- A. All sampling and testing services shall be performed, at the Owners expense, by a testing agency which operates in accordance to ASTM D 3740 and E 329 latest edition and accepted by the Engineer.
- B. The Contractor shall submit for review a design mix for each class of concrete proposed for use. An approved testing laboratory shall prepare the mix. Compressive strength of at least four (4) specimens of the design mix shall indicate 15% higher than 28 days strengths specified. During the work, the Contractor shall make 3 test cylinders for each 50 cubic yards, or fraction thereof, of concrete placed each day. One cylinder shall be tested at 7 days and the other two at 28 days in accordance with ASTM C 39. Copies of all test reports shall be furnished to the Engineer.

**END OF SECTION**

**PART 1: GENERAL****1.01 DESCRIPTION OF WORK**

- A. The extent of concrete reinforcement is shown on the drawings. The work includes fabrication and placement of reinforcement for cast-in-place concrete, including bar, ties and supports.

**1.02 REFERENCES**

- A. Some products and execution are specified in the Section by reference to published specifications or standards of the following with respective abbreviations used:

1. American Concrete Institute.....ACI
2. The American Society for Testing and Materials .....ASTM
3. American Welding Society .....AWS

B. STANDARD REFERENCE

The current edition of the following standard references shall apply to the work of this Section. Suffixes indicating date of issue are omitted from reference numbers used in the text.

1. Publication of the American Concrete Institute:
  - a. ACI 315-74 Manual of Standard Practice for Detailing Reinforced Concrete Structures.
  - b. ACI 318-77 Building Code Requirements for Reinforced Concrete.
2. Publications of the American Welding Society:
  - a. AWS D12.10-61 Recommended Practice for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction
3. Publications of the Concrete Reinforcing Steel Institute: "Manual of Standard Practice"
4. Publications of the American Society for Testing and Materials:
  - a. ASTM A 82-76 Specification for Cold Drawn Steel Wire for Concrete Reinforcement.

- b. ASTM A 185-73 Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
- c. ASTM A 615-78 Specification for Deformed Billet-Steel Bars for Concrete Reinforcement.
- d. ASTM A 617-76 Specification for Axle-Steel Deformed and Plan Bars for Concrete Reinforcement.

### **1.03 DELIVERY, STORAGE AND HANDLING**

- A. Reinforcing Steel shall be delivered to the Project Site properly tagged, bundled, and ready to place. Reinforcing steel delivered to the Project Site, and not immediately placed in forms, shall be protected from mud, excessive rust producing conditions, oil, grease, or distortion. Reinforcing steel shall be stored off the ground.

## **PART 2: PRODUCTS**

### **2.01 MATERIALS**

- A. All reinforcing steel shall conform to one of the following ASTM Standards, latest edition:
  - 1. "Standard Specification for Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A-615, Grade 40.
  - 2. "Standard Specification for Axle Steel Deformed Bars for Concrete Reinforcement, ASTM A-617, Grade 40.
- B. Weld wire fabric shall be electrically welded wire fabric of cold drawn wire of gauge and mesh shown on the drawings or required and shall conform to "Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" (ASTM A-185).
- C. Tie wire shall be 16-gauge or heavier, black annealed wire. Reinforcing shall be free from scale, rust or coatings. Stainless steel or plastic coated bar chairs and spacers shall be furnished where concrete will be exposed.

## **PART 3: EXECUTION**

### **3.01 FABRICATING AND WELDING TOLERANCE**

- A. Bars used for concrete reinforcement shall meet the following requirements for fabrication tolerance.

A. Sheared Length	+1"
B. Overall Dimension of Stirrups	+1/2"
C. All Other Bends	+1"

B. Bars shall be placed to the following tolerances:

A. Concrete Cover to Formed Surfaces	+1/4"
B. Top Bars in Slabs	+1/4"
C. Top Bars in Beams	+1/2"
D. Horizontal Tolerance from Vertical Surfaces	+1/4"
E. Vertical Bars in Columns	+1/4"
F. Vertical and Horizontal Bars in Walls	+1/2"
G. Lengthwise in Member	+2"
H. Wire Fabric	+1/2" from center of slab or location called for on drawings

C. Bars may be moved one bar diameter as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If the bars are moved more than one bar diameter, the resulting arrangement of bars shall be subject to approval.

### 3.02 **WELDING**

A. When required or approved, welding of reinforcing steel shall conform to "Recommended Practice for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction" (AWS D12.1). No welding shall be done at the bend in a bar. Welding of cross bars (tack welding) shall not be permitted except as authorized or directed by the Engineer.

### 3.03 **PLACING**

A. Minimum concrete protective covering for reinforcement except for extremely corrosive atmosphere or other severe exposures shall be as follows:

A. Concrete deposited Against the Ground	3"
B. Formed Surfaces Exposed to Weather or in Contact with the Ground	2"
C. Interior Surfaces:	1-1/2" for Beams and Column Ties; 3/4" for Slabs and Walls; Beam and Column Bars Shall be Anchored Against the Ties.

- B. All reinforcement at the time concrete is placed shall be free of mud, oil, or other materials that may adversely affect or reduce the bond. Reinforcement with rust, mill scale or tooth will be accepted as being satisfactory without cleaning or brushing provided the dimensions and weights, including heights of deformations, of a cleaned sample shall not be less than required by applicable ASTM Standards.
- C. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete beyond the tolerances as previously set forth.
- D. Over formwork, metal, plastic or other approved bar chairs and spacers shall be furnished. When the concrete surface will be exposed to weather in the finished structure or where rust would impair architectural finishes, the portions of all accessories in contact with the formwork shall be stainless steel or plastic.
- E. Welded wire fabric shall be lapped at least 1/2 mesh plus end extension of wires but not less than 6". Wire mesh shall be so placed as to positively secure its position 1/3 of the slab thickness below the top of the slab for slabs on grade.
- F. Splices and offsets in reinforcements at points of maximum stress shall not be made. All splices shall be approved, and shall provide sufficient lap to transfer the stress between the bars by the required development length of the bars. The character and design of each splice shall conform to the requirements of the ACI 318-77. All reinforcing steel shall be stored off the ground at project site. All reinforcing steel shall be cut and shop fabricated and delivered to the project properly tagged, bundled and ready to place. Bars shall not be bent after being embedded in hardened concrete, unless otherwise noted on the drawings. Reinforcing shall be free from scale, loose rust or coatings which will reduce the bond to the concrete. Bars with kinks or bends not shown on the drawings shall not be placed. The heating of reinforcement for bending or straightening will be permitted only if the entire operation is approved by the Engineer.
- G. The Contractor shall securely maintain the metal reinforcement accurately in place until the concrete is placed. Any and all disturbances of reinforcing from any cause whatsoever shall be fully corrected prior to placing of concrete, and all damaged bar supports and spaces shall be repaired or removed and replaced. All bars shall

be extended beyond stress points the development length of the bar or be provided with an equivalent development length with a hook.

H. Unless otherwise shown on the plans and details, the following accessories shall be provided for supports for all reinforcement:

1. Reinforced slabs-on-grade shall have plain precast concrete blocks sufficient to support bars within prescribed tolerances, or individual high chairs with runners to rest on soil.
2. Slab bars shall have continuous slab bolsters for bottom bars spaced a maximum distance of 4'-0" o.c., and for individual high chairs spaced 4'-0" with a #6 continuous support bar for top bars. Top bar supports shall be spaced a maximum distance apart of 4'-0" and no greater than 18" from the overhanging ends of bars.
3. Beam bottom bars shall have beam bolsters spaced a maximum distance of 6'-0". Top beam bars may be supported from beam stirrups where permitted provided beam stirrups are fabricated sufficiently accurate to permit top bars to be placed within the tolerances permitted. Individual high chairs are required where ties or other supports are not provided.
4. Box out all slots, chases, recesses or openings as shown on the drawings and specifications and as required by the work of other trades. Box out for all temporary openings such as slots, pipe spaces, etc., and build forms to seal up when and as required. Inserts, anchors, ties, hangers, etc. shall be built into concrete as required to secure the work of the various subcontractors. Collars, sleeves, thimbles, anchors, sockets, etc., shall be furnished to the General Contractor by the other subcontractors for installation in the formwork. Sleeves shall not displace the reinforcing steel from its designated location by more than one bar diameter unless approved by the Engineer. The Contractor shall be responsible for the design, engineering, construction and the coordination of the placement of items affecting each trade in the formwork.

### **3.04**

### **INSPECTION**

The Engineer shall always be notified of the pouring schedule in advance and in ample time prior to placement of concrete to inspect the reinforcement. Inspection of reinforcement will be made only after each section to be poured is complete.

### **END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

This section includes cast-in-place concrete as shown on Drawings, and as specified herein. In general, this work includes providing cast-in-place concrete consisting of Portland Cement, fine and coarse aggregate, selected admixtures, mixing, transporting, placing, finishing, and curing as herein specified. This section further includes related items of quality control, testing, and evaluation of concrete strength.

**1.02 STANDARDS**

- A. Some products and execution are specified in this section by reference to published specifications or standards of the following with respect abbreviations used.

1. American Concrete Institute .....ACI
2. The American Society for Testing and Materials .....ASTM

- B. The current edition of the following standard references shall apply to the work of this Section as indicated. Suffixes indicating issue date are omitted from reference numerals elsewhere in the text. Concrete work shall comply with the following standards and codes except as indicated otherwise on the Drawings or herein.

1. ACI 301 "Specifications for Structural Concrete"
2. ACI 304 "Recommended Practice for Measuring, Mixing Transporting, and Placing Concrete"
3. ACI 305 "Recommended Practice for Hot Weather Concreting"
4. ACI 306 "Recommended Practice for Cold Weather Concreting"
5. ACI 308 "Recommended Practice for Curing Concrete"
6. ACI 309 "Recommended Practice for Consolidation of Concrete"
7. ACI 311 "Recommended Practice for Concrete Inspection"
8. ACI 214 "Recommended Practice for Evaluation of Compressive Test Results of Field Concrete"



9. ACI 211.1 "Recommended Practice for Selecting Proportions 70 for Normal Weight Concrete"
10. ACI 211.2 "Recommended Practice for Selecting Proportions for Structural light-weight Concrete"
11. ACI 212 "Guide for Use of Admixtures in Concrete"
12. ACI 214 "Recommended Practice for Evaluation of Compression Test Results of Field Concrete"

### **1.03 QUALITY ASSURANCE**

- A. If the average strength of the laboratory control cylinders shows the concrete to be below the specified design strength, the aggregate proportions and water content may be changed by the Engineer, who, in addition to such changes, may require core tests. Tests confirming concrete strengths on hardened concrete, which was poured without testing, shall be paid for by the Contractor.
- B. Prepare design mixes for each class of concrete used in accordance with ACI 311.1. The Contractor shall pay for all design mix costs. Submit written reports to the Engineer for each proposed mix for each class of concrete prior to start of work. Do not begin concrete production until mixes have been reviewed by the Engineer.
- C. Strength data for establishing standard deviation and required overstrength factor will be considered suitable if the concrete production facility has certified records consisting of at least 30 consecutive tests in one group or the statistical average for two groups totaling 30 or more tests representing similar materials and project conditions. Records of these tests shall be submitted with the proposed design mix.
- D. If standard deviation exceeds 800 psi or if no suitable records are available, selected proportions to produce an average strength of at least 1200 psi greater than the required compressive strength of concrete. If standard deviations are less than 600 psi, the minimum overstrength factor required in the design mix shall be in accordance with ACI 318, Section 4.3.1.
- E. Design mixes shall be proportioned using the maximum specified slump and temperature. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by the Engineer before using in the work. Admixtures shall be used in strict accordance with the manufacturer's written instructions. Design mix shall be proportioned using the proposed admixtures at optimum recommended dosages. The manufacturer of the mixture shall prepare and submit test data used to determine the optimum dosage.

### **1.04 SUBMITTALS**

The Contractor shall submit four copies of the proposed design mix for each class of concrete specified herein in accordance with the requirements herein. Design mixes shall be submitted two weeks prior to placement of concrete. The cost of the design mix shall be paid for by the contractor. Submit records of all concrete pours showing exact location of pour, date of pour, quantity of pour, and class of concrete poured to the Engineer each month. Temperature at time of pour should also be recorded. Submit to the Engineer chemical and physical analysis of all cement and fly ash delivered to the batch plant seven (7) days prior to use of the cement or fly ash.

## **PART 2: PRODUCTS**

### **2.01 MATERIALS**

- A. PORTLAND CEMENT shall be fresh stock of an approved standard brand meeting the requirements of ASTM C-150, of Type II and shall be 4000 PSI unless otherwise specified. Only one brand of cement shall be used except when otherwise approved by the Engineer, and the Contractor shall inform the Engineer of the brand name of the cement proposed for use. The Contractor shall submit a copy of mill test reports on all cement delivered to the job 7 days prior to use of the cement. Cube strength from mill tests shall have a tolerance of  $\pm 600$  psi. The fineness of cement used shall not have more than 10% retained on a #325 mesh screen when tested in accordance with ASTM C-430.
- B. FLY ASH shall have a high fineness and low carbon content and shall exceed the requirements of ASTM C-618. Specifications for Fly Ash and Raw or Calcined Natural for use in Portland Cement Concretes for Class 7, except that the loss of ignition shall be less than 3%, and all fly ash shall be a classified processed material. Fly ash shall be obtained from one source for the concrete delivered to the project. Complete chemical and physical analysis of each carload of fly ash shall be submitted to the Engineer ten (10) days prior to use of each carload delivered. Concrete mixes proportioned with fly ash shall contain not less than 10% nor more than 20% by weight of cement of fly ash.
- C. CONCRETE AGGREGATE for stone concrete shall consist of clean crushed stone or gravel having hard, strong, uncoated particles free from injurious amounts of soft, thin, elongated or laminated pieces, alkali, organic or other deleterious matter. Maximum aggregate size shall be 3/4" of slabs, columns, etc. The maximum permissible percentage of elongated particles shall not exceed 5% by weight. Elongated particles are those defined as having a length equal to or greater than 5 times the width. Samples of coarse aggregate shall be submitted to the testing laboratory for testing and approval prior to use. The fineness modulus of the coarse aggregate shall not vary for more than  $\pm 0.3\%$ .
- D. FINE AGGREGATE shall consist of sand, stone screening, or other inert materials with similar characteristics having clean, strong, durable, uncoated grains and free from lumps, soft or flaky particles, clay, shale, alkali, organic

matter or other deleterious substances. Fine aggregate shall be submitted for testing and approval to the testing laboratory. The laboratory shall verify that fine aggregate conforms to ASTM standards by making standard colormetric, sediment, and comparative tensile tests, and by sieve analysis. The fineness modules of the sand shall not vary by more than  $\pm 0.2\%$ . Color shall be standard as determined from colormetric tests.

- E. CONCRETE ADMIXTURES, when required or permitted shall conform to the appropriate specification listed. Do not use admixtures, which have not been incorporated and tested in the accepted mixes unless otherwise authorized in writing by the Engineer. Air-entraining admixtures shall exceed the requirements of ASTM C-260, "Specifications for Air-Entraining Admixtures for Concrete". Water reducing admixtures shall be hydroxolated polymer type exceeding the requirements of ASTM C-494, Type A.
- F. PREMOLDED EXPANSION JOINT FILLERS shall conform to ASTM D1751.
- G. LIQUID CURING MATERIAL for concrete shall exceed the requirements of ASTM C-309, Type I. Products acceptable shall provide water retention not exceeding a loss of 0.020 grams per sq. cm. when tested at a coverage of 200 sq. ft. per gallon and tested in accordance with ASTM C-156. Submit test data verifying these requirements for approval.
- H. BURLAP shall be free of sizing or any substance that is injurious to cement or can cause discoloration. Burlap shall be rinsed in water prior to use. Burlap shall be sufficient thickness to retain water without requiring wetting.
- I. STEEL FOR EMBEDDED ANGLES AND PLATE CAST IN CONCRETE shall conform to ASTM A-36. Plates and angles shall receive a commercial sand blast and be painted with an inorganic zinc base paint equal to Carbomastic #11, or an approved equal.
- J. CRUSHED STONE FILL, 4" in depth, shall be placed under all concrete floors in contact with the ground. Stone shall be uniform 3/4" stone, no fines, compacted as thoroughly as possible by tamping and rolling. Stone fill shall conform to ASTM C-33.
- K. VAPOR BARRIER shall be a minimum of a 6 mil polyethylene.
- L. WATERSTOPS shall be Sealtight PVC waterstrips as manufactured by the W.R. Meadows Co., or an approved equal. All waterstops shall be Type 6316. Water bars shall be located in all expansive joints in the concrete and in all construction joints in concrete walls.
- M. JOINT SEALING COMPOUND shall be a two-part mineral filled epoxy polyurethane, and shall be used for all exposed joints in exterior paving slabs,

sidewalks, where concrete slabs abut concrete walls, and in exposed joints in slabs on grade.

- N. SURFACE COATING for all exposed concrete except where otherwise shown shall be a masonry water proofer or sealer.
- O. AIR ENTRAINMENT: Air-entraining admixtures shall be used for all concrete exposed to freezing and thawing or subjected to hydraulic pressure. Entrained air shall conform to the air control limits of Table 3.4.1 of ACI 301. The water-cement ratio for all air-entrained concrete exposed to freezing and thawing shall not exceed 0.53.
- P. SLUMPS: All concrete shall be proportioned and produced to have a maximum slump of 4" and a minimum slump of 2" as per ASTM C143. A tolerance of up to but not exceeding 1" above the indicated maximum shall be allowed for individual batches in any one day's pour provided the average of the most recent ten batches within the same pour does not exceed the maximum limits. No tolerance will be permitted for individual batches when less than ten (10) batches are delivered for one day's pour.
- Q. CONCRETE MIXING
  - 1. Concrete shall be mixed at batch plants or it may be transit mixed as specified herein. Concrete batch plants must comply with the requirements of ASTM C-94 for ready-mixed concrete, ASTM C33 for aggregates and ACI-304 with sufficient capacity of producing concrete of the quantity and quality as specified herein. All plant facilities are subject to inspection by the Engineer. Ready-mix concrete shall comply with requirements of ASTM C-94, and as specified herein, unless otherwise noted. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C-94 will be required as follows:
    - a. When air temperatures are between 80°F. and 90°F., reduce the mixing and delivery time from 1-1/2 hours to 1 hour
    - b. When outside air temperatures are above 90°F, reduce the mixing and delivery time from 1-1/2 hours to 45 minutes.
  - 2. Addition of water at the site for concrete mix with insufficient slumps, slumps less than the maximum specified herein, will not be permitted. Concrete delivered to the project with slump less than the minimum or greater than the maximum specified shall be rejected and discarded off site.
  - 3. Batch tickets for each load of concrete shall be submitted to the Engineer. The following information shall be provided on each batch ticket:

- a. Design mix designation
  - b. Exact time cement, water and aggregate were discharged into the mix
  - c. Compressive strength of mix
  - d. Amount of water added to the mix
4. Maintain equipment in proper operating condition, with drums cleaned before charging of each batch. Schedule delivery of trucks in order to prevent delay of placing after mixing.

5. CONCRETE TYPE AND STRENGTHS

Location	Maximum Size Aggregate	*28 Day Compressive Strength
Slabs on Grade	3/4"	4000 psi
Walls	3/4"	4000 psi
Walks and Steps	3/4"	4000 psi

\*Twenty-eight day strength shall be as determined from concrete sampled in accordance with ASTM C-172 and standard 6" x 12" molded cylinders tested in accordance with ASTM C-31 and C-39.

\*\*See notes on plans for required concrete strengths.

## PART 3: EXECUTION

### 3.01 PREPARATION

Before placing concrete, all equipment for mixing and transporting and placing concrete shall be cleaned, all debris and ice removed from spaces to be occupied by the concrete, forms thoroughly cleaned of soil, ice, or other coatings which will prevent proper bond, reinforcement shall be securely tied in place and expansion joint material, anchors, and other embedded items shall be securely positioned. Hardened concrete and foreign materials shall be removed from the conveying equipment.

### 3.02 CONCRETE PLACEMENT

- A. Place concrete in compliance with the practices and recommendations of ACI 304 or as herein specified. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods, which will prevent separation or loss of ingredients and in a manner, which will assure that the required quality concrete, is obtained. Conveying equipment shall be of size and design to insure a continuous flow of concrete at the delivery end.

- B. Concrete shall be deposited continuous, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located at points as provided for in the drawings or as approved. Placing shall be carried on at such a rate that the concrete, which is being integrated, with fresh concrete is still plastic. Deposit concrete as nearly as possible to its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure, which will cause segregation.
- C. Concrete shall not be allowed to "freefall" a distance greater than 3'-0". All concrete placed in columns and walls shall be placed through a tremie with the bottom or outlet of the tremie being held at maximum of 3'-0" above the surface where concrete is being placed.
- D. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
- E. Do not use concrete which has become non-plastic and unworkable or does not meet the required quality control limits, or which has become contaminated by foreign material. Remove rejected concrete from the project site and dispose of in an acceptable location. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, and tamping. Vibration of forms and reinforcing steel will not be permitted.
- F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vertically at uniformly spaced locations not further than the visible effectiveness of the vibrator. Do not insert vibrators into lower levels of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcing and other embedded items without causing segregation of the mix.
- G. Deposit and consolidate concrete in slabs in a continuous operation, within the limits of construction joints until the placing of the entire section is complete.
- H. Bring surface of slabs to the correct elevations with a straight edge and strike off. Use bull floats or darbies to smooth the surface, leaving it free of lumps and hollows. Do not sprinkle water on the plastic surface. Do not disturb the surface prior to beginning the finish operation.
- I. Concrete placed by plumbing shall conform to the recommendations of ACI Publication, "Placing Concrete by Pumping Methods."

### **3.03 CONSTRUCTION JOINTS**

Joints not shown on the drawings shall be made at locations that will least impair the strength of the structure and shall be approved by the Engineer. In general, they shall be located near the middle of the span of members. Joints in walls and columns shall be located at the underside of floors or slabs, and the tops of foundation walls. Roughen surfaces of hardened concrete at all vertical construction joints. Clean surface of laitance, coatings, loose particles, and foreign matter to expose aggregate. Prepare for bonding of fresh concrete to new concrete that has hardened; at joints between foundation systems and walls dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing fresh concrete. In lieu of neat cement grout, bonding grout may be a commercial bonding agent. Apply to cleaned concrete surfaces in accordance with the printed instruction of this bonding material manufacturer. Provide keyways at least 1-1/2" deep in all construction joints in walls, slabs, and between walls, and foundation systems. Provide PVC Waterstops in all construction joints in concrete walls and in concrete beams and slabs. PVC waterstops shall also be provided between concrete beams and slabs at all expansion joints.

### **3.04 COLD WEATHER PLACING AND CURING REQUIREMENTS**

- A. No concrete is to be placed when the air temperature is 40° F or below and the predicted low temperature for the succeeding 24-hour period is less than 32° F.
- B. All Concrete when placed in the forms shall have a temperature of between 50° and 90° F and shall be maintained at a temperature of not less than 50° F for at least 72 hours for normal concrete and 24 hours for high early strength concrete, or for as much time as is necessary to secure proper rate of curing and designed compressive strength.

### **3.05 HOT WEATHER PLACING**

An approved admixture designed to retard the rate of set shall be used for all concrete placed when temperatures exceed 75°F. Set retarding admixtures shall conform to ASTM C-494, Type D, water reducing and retarding. Wet forms thoroughly before placing. Cool reinforcing by wetting sufficiently so that steel temperatures will be nearly equal to the ambient air temperature. Provide windbreaks around the perimeter of the area where concrete is being placed. Fresh concrete with temperatures of 90°F. or above shall be discarded off site. The amount of cement used in the job is computed for the temperature indicated on the approved design mix. For higher concrete mix temperature, the weight of the cement shall be increased at the rate of 12 lbs. per cubic yard for each 10°F. above the concrete mix temperature.

### **3.06 CURING AND PROTECTION**

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures, and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.

- B. Curing for all horizontal slab surfaces, except those to receive a bonded finish material, during periods when the outside air temperature does not exceed 60°F. shall be provided by applying a membrane-forming curing compound to concrete surfaces as soon as the final troweling or floating operation has been completed. Apply uniformly with a roller brush at a rate not to exceed 200 sq. ft. per gallon. Maintain the continuity of the coating and repair damage to the coat during the entire curing period. Curing for surfaces to receive a bonded finish material shall be as noted below. Curing for all horizontal surfaces during period when the outside air temperature will exceed 60°F. shall be provided by covering the entire surface with burlap. The burlap shall be lapped 1/2 width in order to provide a double thickness of burlap. Immediately following the placement of the burlap, the entire surface shall be maintained continuously wet for a period of 7 days. Do not permit surfaces to dry at any period during the required curing period.
- C. Cure formed surfaces by moist curing with the forms in place for the full curing period, or until forms are removed. If forms are removed before the curing period is complete, apply a membrane-forming curing compound to damp surfaces as soon as the water film has disappeared. Apply uniformly in continuous operation by roller brushes in accordance with the manufacturer's directions.
- D. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with any other cover or finish material which shall be bonded to the concrete. These surfaces must be watercured with a full coverage of burlap kept continuously moist for a period of 7 days.
- E. During the curing period, protect concrete from damaging mechanical disturbances, including load stresses, shocks, excessive vibration and from change caused by subsequent construction operations.

### **3.07 SURFACE REPAIRS**

- A. Repair and patch defective areas immediately after removal of forms as directed by the Engineer. Cut out honeycombs, rock pockets, voids over 1/2" in diameter and holes left by tie rods and bolts down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surfaces. Exposed reinforcing steel with at least 3/4" clearance all around. Dampen all concrete surfaces in contact with patching concrete, and brush with a neat cement grout coating or concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials to provide concrete of the same type or class as the original adjacent concrete. Place, compact, and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
- B. Fill holes extending through concrete by means of a plunger type gun or other suitable device from the least exposed face to insure complete filling. Remove stains and other discolorations that cannot be removed by cleaning for all exposed



surfaces. Repair isolated random cracks and single holes not over 1" in diameter by the dry-pack method. Groove the top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and brush with a neat cement grout coating. Place dry-pack, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a #16 mesh sieve using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match the existing surface.

- C. Fill in holes and openings left in concrete structures for the passage of work by other trades, unless otherwise shown or directed, after the work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide all other miscellaneous concrete filling shown or required to complete work.
- D. Correct high areas in unformed surfaces by grinding, after the concrete has cured at least 14 days. Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.

### **3.08 SLABS ON GRADE**

#### **A. PREPARATION OF SUBGRADE**

The subgrade shall be well drained and of adequate and uniform loadbearing nature. The in-place density of the subgrade soils shall be at least the minimum required in the specifications. The bottom of an undrained granular base course shall not be lower than the adjacent finished grade. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing, it shall be raised and maintained above 50°F. long enough to remove all frost from the subgrade. The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall be no free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.

#### **B. JOINTS**

Joints in slabs on grade shall be located as to divide the slab in areas not in excess of 800 sq. ft. The maximum distance between joints in slabs on grade at all points of contact between slabs on grade and vertical surfaces such as foundation walls and elsewhere as indicated. At exposed joints, recess the premolded fill on a minimum of 1/2", and fill the remaining section with a joint seal and as specified herein. All exposed construction joints in the slabs on grade shall have the edges tooled and the crack and groove formed by the edging tool filled with a polyurethane joint sealant. No kold-key or metal form joints will be permitted.

### **3.09 SIDEWALKS**

- A. Brooming of the concrete surface shall be done transverse to the direction of traffic. Joint spacing shall not be less than 5'-0". Where existing sidewalks are being widened, transverse joints shall be located so as to line up with existing joints in the adjacent sidewalk. Joints shall not be sealed.
- B. All sidewalks shall contain 6"x6" / 1.4x1.4 WWF. Chairs shall be installed or WWF lifted during placement to allow WWF to be within middle 1/3 of sidewalk cross section.
- C. Backfill shall be compacted to a degree comparable to the adjacent undisturbed material.

### **3.10 CURB AND GUTTER**

- A. Concrete curb/curb and gutter shall meet the requirements of Section 846-3 of the NCDOT Standard Specifications for Roads and Structures (latest edition).
- B. The concrete shall be given a light broom finish with the brush marks parallel to the curb line or gutter line.
- C. No earth backfill or pavement shall be placed adjacent to the curb and gutter until at least three curing days have elapsed. Backfill shall be compacted to a degree satisfactory to the Engineer.

### **3.11 FINISHES**

#### **A. STANDARD ROUGH FORM FINISH**

Provide a standard rough form finish to all concrete formed surfaces that are to be concealed in the finish work or other construction. (**NOTE:** Interior faces of walls of water retaining structures are not considered to be concealed.) Standard rough form finish shall consist of all defective areas repaired as specified and all holes or voids larger than 3/8" filled with cement grout.

#### **B. STANDARD FINISH FOR EXPOSED SURFACES**

Provide an applied surface finish of Masonry Water proofer or Sealer to all exposed interior and exterior concrete finishes unless otherwise noted. Interior faces of walls of water retaining structures, including areas which are normally submerged, are considered to be exposed surfaces and shall receive the specified standard finish for exposed surfaces. The surface finish shall consist of chopping and/or grinding down all high spots removing grinding of all burrs and/or other projections, filling all voids 3/8" and larger, and cutting out all unsound concrete and patching as specified herein. Before applying the finish, wet and clean the surface of all grease, oils, efflorescence, and other foreign material. Dampen surface immediately ahead of application. Apply the finish coat with a tampico

fiber brush by laying the finish coat on the wall in a thick coat of a minimum of 2 lbs. per sq. yard, and brush to a uniform level surface. Do not apply in temperatures 40°F or below, or when temperatures are likely to fall below 40°F within 24 hours after application. The finish coat shall be mixed in strict accordance with the manufacturer's written instructions. After the finish coat has cured, apply a finish coat of masonry water proofer or sealer at a minimum of 12 lb. per sq. yd. Trained technicians shall apply the masonry water proofer or sealer.

C. SMOOTH FORM FINISH

Provide a smooth form finish for all exposed interior concrete walls inside buildings, in pipe gallery areas, or as noted on the Drawings. Standard form finish shall produce a smooth, hard, uniform texture on the concrete. The arrangement of the forms and the number of seams and joints shall be kept to a minimum. Immediately after forms are removed, cut out all unsound concrete and patch as specified herein, and fill all pinholes and other voids larger than 1/4" with a cement grout. Compress mortar into voids with a firm rubber trowel or float. After mortar dries, wipe off surface with burlap.

D. SLAB FINISHES

1. Scratched Finish

After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, the surface shall be roughened with stiff brushes or rakes before a final set. A scratched finish shall be applied to all surfaces which are to receive a bonded surface finish.

2. Floated Finish

After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked with a 10'-0" straight edge applied at not less than two different angles. All high spots shall be cut down and all low spots filled during this procedure to produce a surface with Class B tolerance throughout. This slab shall then be floated immediately to a uniform sandy texture. A float finish shall be applied to all slab surfaces, which are to receive a waterproofing membrane.

3. Troweled Finish

The surface shall first be float-finished as specified. It shall next be power troweled, and finally hand troweled. The first troweling after power floating shall produce a smooth surface, which may still show some

trowel, marks. Additional troweling shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be essentially free of trowel marks, uniform in texture, and appearance, and shall be planed to a Class tolerance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding. A trowel finish shall be applied to all surfaces, which are exposed to view or are to receive a floor covering of carpet, vinyl, asbestos, tiles, etc.

4. Broom Finish

Immediately after the concrete has received a float finish as specified in Section B, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface. A broom finish shall be applied to all parking surfaces, exterior concrete walks, and concrete paving slabs.

**3.12 FINISHING TOLERANCES**

Finishes with a Class C tolerance shall be true planes within 1/4" in 2'-0" as determined by a 2'-0" straight edge placed elsewhere on the slab in any direction. Variation from level for Class A. tolerance shall not exceed 1/4" in 10'-0" or 1/2" maximum in any one bay between columns. Variation from level for a Class B and Class C finish shall not exceed 1/4" in 10'-0" or 3/4" in any one bay between columns.

**3.13 RELATED UNFORMED SURFACES**

As tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surface unless otherwise shown.

**3.14 MISCELLANEOUS CONCRETE ITEMS**

- A. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- B. Provide machine and equipment bases and foundations, as shown on the drawings. Set anchor bolts for machines and equipment to template at correct elevations prior to placement of the concrete, complying with certified diagrams or templates of the manufacturer finishing machines and equipment.

**3.15 INSPECTION**

Before placing concrete, the formwork installation, reinforcing steel, and items to be embedded or cast-in must be complete. Notify other crafts involved in ample time to permit the installation of their work; co-operate with other trades in setting such work, as required. Notify Engineer upon completion of installation of all reinforcing and other items in ample time to permit inspection of the work before concrete is poured. Soil bottoms at foundation systems are subject to testing laboratory as directed by the Engineer. Place concrete immediately after approval of foundation excavations.

### **3.16 TESTING AND QUALITY CONTROL**

- A. The Owner shall employ a concrete testing laboratory to provide all laboratory testing services on the project and a concrete technician to perform all quality control tests on concrete and materials used to batch concrete. The testing agency employed shall meet the requirement of "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction", (ASTM E-329).
- B. The Contractor shall provide and maintain adequate facilities on the project for the testing laboratory to locate the required testing equipment and for safe storage area for test cylinders. The general contractor shall provide at his own expense all casual labor needed to assist the concrete technician in obtaining samples of concrete and concrete materials and moving and transporting cylinders and materials which are being tested.
- C. The following services shall be performed by the designated testing agency:
  - 1. Review and/or check-test the Contractor's proposed materials for compliance with the specifications.
  - 2. Review and/or check-test the Contractor's proposed mix design as required by the Engineer.
  - 3. Secure production samples of materials at plants or stock-piles during the course of the work and test for compliance with the specifications as required by the Engineer.
  - 4. Conduct strength tests of the concrete during construction in accordance with the following procedures:
    - a. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C-172). Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
    - b. Mold and cure three specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and

Flexural Specimens in the Field" (ASTM C-31). Any deviations from the requirements of this Standard shall be recorded in the test report.

- c. Test specimens in accordance with "Method of Test for Compression Strength of Molded Concrete Cylinders" (ASTM C-39). Two specimens shall be tested at 28 days for acceptance and one shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in the test show any of the above defects, the entire test shall be discarded. When high early strength concrete is used, the specimens shall be tested at the ages indicated in the Contract Documents.
  - d. Make at least one strength test for each 50 cu. yd., or fraction thereof, of each mix design of concrete placed in any 1 day. When the total quantity of concrete with a given mix design is less than 50 cu. yd., the strength test may be waived by the Engineer if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.
- 5. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using "Method of Test for Slump of Portland Cement Concrete" (ASTM C-143). Slump is to be 4" with a +/- 1" tolerance. Anything not in this range is to be approved by the engineer prior to placement.
  - 6. Determine air content of normal weight concrete sample for each strength test in accordance with either "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C-231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C-173), or "Method of Test for Weight per Cubic Foot, Yield and Air Content (Gravimetric) of Concrete", (ASTM C-138). Concrete shall be air entrained with 5-7% air.
  - 7. Determine unit weight of concrete sample for each strength test.
  - 8. Determine temperature of concrete sample for each strength test. If temperature is 90° or above, concrete is not to be used.
  - 9. Determine in-place strength of concrete by curing cylinders under the same field conditions that the concrete representing these field cylinders is

cured and additionally by determining the degree/hours of curing required for the concrete to develop the required strength for form removal.

10. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the Engineer.

### **3.17 EVALUATION AND ACCEPTANCE OF CONCRETE STRUCTURES**

- A. The concrete quality control testing as specified will be evaluated by the following criteria:
  1. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of three consecutive compressive strength test results equal or exceed the 28-day design compressive strength of the type of class of concrete; and, no individual strength test falls below the required compressive strength by more than 500 psi. If compressive strength tests fail to meet these requirements, the concrete represented by these tests will be considered deficient and subject to additional testing and/or removal.
  2. Concrete work, which does not conform to the specified requirements, including strength, tolerance and finishes, shall be corrected as directed at the Contractors expense, without extension of time therefor. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from correction to the concrete work. Core tests, if required, shall be evaluated in accordance with the requirements of ACI 318-77.

**END OF SECTION**

## SECTION 26 00 00 - GENERAL ELECTRICAL REQUIREMENTS

### PART 1 – GENERAL

- 1.1 This section is intended to supplement or modify the conditions and requirements defined in the General or Project Requirements given in the General Requirements of this specification. The General Requirements and this Section shall apply to all electrical work as described in Electrical Specification Sections 26 00 00 through 26 09 99.
- 1.2 WORK COVERED BY CONTRACT DOCUMENTS
  - A. All work, materials, etc., shall be furnished and installed, whether or not specifically shown on the drawings and/or called for in the specifications, which may be necessary to comply with all of the requirements, due to the exigencies of the work, to complete the work and the contract in a satisfactory and approved manner.
  - B. The work to be done under this contract shall consist of furnishing all equipment, labor, materials required for the items listed in the proposal, and/or as shown on the contract drawings, together with all devices, connectors, splices and appurtenances, required for a safe, clean, complete and ready for service, reliable, substantial and rugged working installation, to the satisfaction of the Engineer and to execute the intent of this contract and these specifications.
  - C. The Contractor shall be responsible for determining the proper connection points for all power, control, and signal wiring installed under this contract, regardless of whether the connection points are in equipment furnished under this contract, existing equipment, or equipment furnished by others. The Contractor shall include in his bid prices any field surveys, wire tracing or other work required to ascertain the proper connection points for all wiring.
  - D. It is the intent of these specifications that the Contractor shall furnish equipment and material which is suitable for the purpose and for installation in the location as specified, and which is adequate and satisfactory for the service intended.
  - E. It is also the intent of the specification that the equipment, materials and accessories, as furnished, shall be complete in all respect and ready to operate.
  - F. The specifications cover the general design, construction arrangement, and certain particular features, but do not purport to cover all details entering into the design of the equipment and accessories.
  - G. Minor revisions in construction details will be made to accommodate equipment proposed and approved on the drawings thereof, submitted by the Contractor. Major revisions shall not be made nor shall equipment be submitted for approval which cannot be installed in structures of the approximate dimensions and character specified herein.
  - H. Further, it is also the intent of these specifications to provide a complete contract including items which may be omitted or not shown but which are considered normal and accepted engineering practice for this type of contract at no additional cost to the Owner.
  - I. All work shall be done in a thorough and workmanlike manner and shall conform to the best modern practice in the manufacture and installation of high-grade equipment and materials. Wherever possible, all parts shall be made according to standard gauge to facilitate replacement and repair.
  - J. All materials furnished under these items shall be the best of their respective kinds and shall be free from



defects in design and workmanship.

- K. All materials or equipment not meeting the specified requirements shall be rejected and shall be replaced at once by the Contractor with materials or equipment of the specified type and quality, at no cost to the Owner.
- L. All materials for which no detailed specifications are given herein shall be of the quality and character best adapted and suitable for the purpose for which they are to be used and shall be subject to the approval of the Engineer.
- M. Where any material or article or the maker or distributor thereof is specified by name, this is done for the purpose of more clearly describing the type or quality desired. Any material or article of equal quality, merit and performance, in the opinion of the Engineer, will be acceptable, if approval is given in writing.
- N. All materials furnished and work done by the Contractor shall be subject to the inspection of the Engineer. Defective materials shall be removed from the site of the work and defective work repaired or replaced as directed. Facilities for handling and inspection of materials and equipment and for access to the work in progress, shall at all times be furnished by the Contractor.
- O. Where any delay is encountered in carrying out work due to unfavorable operating conditions, the Contractor shall not be entitled to additional compensation therefore, but the time allowed equivalent to the period of actual delay.

### 1.3 DESCRIPTION OF WORK

- A. Work includes all labor, equipment, wiring, termination, testing and documentation to satisfy the design intend described in the contract documents for all electrical, tele/data and lighting systems in the building to the satisfaction of the Engineer.
- B. Unless specifically dimensioned, the work shown on the drawings is diagrammatic, and is intended only to show general arrangement.
- C. Include in the work, all accessories and devices necessary for the intended operation or perfection of any system, whether or not specifically shown or specified.
- D. The term "Furnish" shall mean to obtain and supply to the job site. The term "Install" shall generally mean to fix in position and connect for use. Where language indicates that one party or trade is to "install" and another is to "connect", the term "install" shall mean only to fix in position, and "connect" shall mean to make electrical connections to. The term "Provide" shall mean to furnish and install.
- E. Testing & Start-Up:
  - 1. Start-up & test each component of all building systems covered by the contract documents.

### 1.4 STANDARD OF QUALITY

- A. The specifications establish the standards of quality required, either by description or by references, to brand name, name of manufacturers or manufacturer's model number. All materials shall be new unless noted otherwise.
- B. Where one or multiple products are specifically identified by name or manufacturer's model number, the cited examples are used only to denote the quality standard of the product desired and they do not restrict

the contractor to a specific brand, make, manufacturer or specific name. They are used only to set forth and convey to bidders the general style, type, character and quality of product desired. The function, performance and quality of the specified item shall meet the criteria set forth. Equivalent or better products will be acceptable unless an item is specifically identified on the bid sheet as an owner-preferred alternate item in compliance with NC. G.S. 133.3.

- C. The Contractor may submit, with his bid, the names of products which are proposed as substitutions for products named in the specifications. Each proposed substitution shall be accompanied by a written sum of money to be added or deducted from his bid. The Owner reserves the sole right to accept or reject said substitutions with or without cause.
- D. When equipment and/or materials are proposed to be purchased from a manufacturer other than those specified, the Contractor shall provide complete data adequate for the Engineer's evaluation of the proposed substitution.
- E. When the equipment other than that specified is used, the Contractor shall be responsible for any extra cost of required revisions such as structural steel, concrete, electrical, piping, etc. Such additional costs shall be identified at the time such substitutions are proposed.

## 1.5 SUBMITTALS

- A. Engineers review of shop drawings is solely for the benefit of the Owner and in no way relieves the contractor from his obligations to furnish materials which satisfy the requirements of his contract and the design intent.
- B. Shop drawings, product data and samples shall be submitted as required by the General Conditions or Project Requirements and as supplemented by this section.
- C. When a specific specification section identifies that no submittal is required, the contractor shall provide the specified materials without submittals.
- D. Provide to the Engineer, a schedule of shop drawing submissions identifying submittal target dates.
- E. The Contractor shall review, approve and submit shop drawings, with promptness so as to cause no delay in his work or in that of others. No submissions will be accepted by the Engineer without the signed review and approval of the Contractor.
- F. The Contractor shall check and verify pertinent field measurements, and quantities of equipment and materials required.
- G. Submittals shall be identified by reference to the drawing(s), section(s) of specifications, or equipment symbols to which they relate.
- H. Shop drawings, when required, shall include:
  - 1. Verification of information given in Contract Documents such as performance, dimensions, weight, materials, construction, types, models, manufacturer, etc.
  - 2. Equipment layouts drawn to scale as may be required.
  - 3. Wiring diagrams and schematics for equipment.
  - 4. Any special construction conditions.
  - 5. Other information/data as may be requested.
- I. All submittals shall identify the specific details of the product or assembly. All optional features being

provided or proposed shall be so noted or the submittal will be rejected.

- J. The Engineer will return submittals with one of the following notations stamped thereon; REVIEWED, REVIEWED AS NOTED, REVISE AND RESUBMIT, REJECTED or SUBMIT SPECIFIED ITEM AND THE FOLLOWING:
1. Review is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
  2. The work involved may proceed when submittals are marked REVIEWED or NO EXCEPTIONS TAKEN with no further submission required.
  3. The work involved may proceed when submittals are marked REVIEWED AS NOTED providing corrections are made and submittals are resubmitted for record. Review does not authorize changes to Contract Sum unless stated in a separate letter or Change Order. If any notes placed on the submittals by the Engineer are believed to result in a change in the Contract Sum, the Engineer shall be notified immediately, and fabrication may not be undertaken until written authorization to proceed is issued by the Owner.
  4. The work involved may not proceed when submittals are marked REVISE AND RESUBMIT. Submittals must be corrected and resubmitted for review.
  5. Submittals marked REJECTED OR SUBMIT SPECIFIED ITEM are not in accordance with the Contract Documents and require a new submittal for review.
- K. For items being resubmitted, clearly identify changes made from the initial submittal requested by the Engineer. The Engineer will review only those changes requested and identified by the Contractor.

#### 1.6 PROTECTION OF WORK

- A. Each Contractor is responsible for the protection of his materials, equipment, and completed work as defined in the General or Project Requirements and as supplemented herein.
- B. All openings into any part of the conduit systems, all fixtures and equipment must be securely covered or otherwise protected to prevent damage due to dropped tools or materials, work by others or intrusion of grit, dirt, water, snow, ice or other foreign matter. Remove burrs, dirt, paint spots and debris. The Contractor shall be held responsible for all damage done to unprotected work or materials.
- C. All equipment on site, whether stored or installed, shall be protected with weather tight covers.

#### 1.7 STEEL AND CONCRETE WORK FOR ELECTRICAL EQUIPMENT

- A. Steel
1. Provide all miscellaneous steel supports and anchors required for equipment and materials installed under this Specification. Manual of Construction by American Institute of Steel Construction latest edition shall be followed in design and construction except that the second sentence of paragraph 4.2.1., Section 4 of Division 5, page 5-177 will not apply. Structural steel members shall conform to ASTM A36, and shall have a shop applied coat of rust inhibiting paint.
  2. Welding of steel shall conform to American Welding Society, Standard Code for Arc and Gas Welding in Building Construction.
  3. Bolts, nuts and washers for structural steel framing and concrete embedment shall be high tensile type minimum 3/4" diameter conforming to ASTM A325.

- B. Slotted-steel channel supports shall have flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum 2 inches o.c., in webs. Channel depth: 2-1/2 inches minimum. Channel thickness: selected to suit structural loading. Fittings and Accessories: Products of the same channel manufacturer. Channel supports and fittings shall be hot dip galvanized steel.
- C. Concrete work and anchors
  - 1. Refer to Section 260050 and Division 03 for concrete work and anchors.

#### 1.8 COUNTERFLASHING

- A. Where conduits or other items pass through any roof, wall or other exterior component, provide counter flashing as required.

#### 1.9 EQUIPMENT BY OTHERS

- A. Section - Summary of Work, together with other technical sections in the Project Manual, describe equipment that will be furnished by the Owner or from other sources.
- B. The responsibility for setting, installation and protection of such equipment will be defined in other sections of the Project Manual.
- C. Provide services rough-in for and make final connections to this equipment as shown and specified.
- D. Provide coordination to assure clearances required for moving equipment to final location.

#### 1.10 MOVING AND INSTALLATION OF RACEWAYS, DEVICES AND EQUIPMENT

- A. Verify that electrical equipment will pass through all restricting openings, and when equipment or sections of equipment are larger than these openings, install this equipment prior to construction of enclosing walls, floors or roofs.
- B. Use planking or cribbing as required to protect adjoining construction from damage.
- C. Provide rigging and scaffolding with expert rigging / scaffolding personnel as required for equipment installation in difficult locations. Rigging & scaffolding shall include any necessary structural investigation and temporary structural support.

#### 1.11 CUTTING AND PATCHING

- A. Provide all openings through walls, floors and ceilings, etc. required for the installation of work defined on the drawings and specifications.
- B. Following installation and testing, restore floors, walls and ceilings with materials equal to the original construction and finish to match existing surfaces.
- C. Cutting and patching shall be performed only by tradesmen familiar with the construction involved.

#### 1.12 IDENTIFICATION

- A. Refer to Section 26 01 95.

#### 1.13 FINAL ACCEPTANCE

- A. The Contractor shall perform and complete work in accordance with the Contract Documents without fault or defect of any kind. In the absence of more specific directives, the work shall:
  - 1. Be completed in a first-class manner.
  - 2. Be placed in a thoroughly clean and unmarred condition.
  - 3. Be checked out in a step-by-step manner to ascertain that fastenings, controls, parts, safety devices, operating devices and other required appurtenances have been provided in accordance with the Contract Documents.
  - 4. Be free of previously condemned or rejected parts and be properly restored to an acceptable condition.
  - 5. Be adjusted for proper operation wherever adjustments or calibrations exist in the work.
  - 6. All systems shall be operated to demonstrate that the requirements of the Contract have been met and that the systems have been adjusted and will operate in accordance therewith.

#### 1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Furnish for review, three hard bound copies of complete written instructions for the operation, care and maintenance of each piece of equipment and/or system. Include recommended frequency of inspection, cleaning, oiling, greasing, and adjustment and other action as may be required in accordance with manufacturer's recommendations. Material shall include manufacturer's brochures, catalog cuts, parts lists, wiring diagrams, service organizations, etc.

#### 1.15 PERMITS, FEES AND CERTIFICATES OF APPROVAL

- A. Contractor shall acquire all required permits and certificates. Inspection fees fixed by counties and municipalities shall not be applicable per GS143-135.1.
- B. Contractor shall provide all power, labor and instruments required for tests and cleaning of systems.
- C. Whenever tests are required, three (3) copies of the test reports shall be submitted to the Engineer.
- D. Tests may be observed by the Engineer or his representative. Notify the Engineer a minimum of three weeks in advance of test dates.

#### 1.16 COMPLIANCE WITH CODES, STANDARDS AND REGULATIONS

- A. In the absence of specific instruction in the technical specifications, equipment and installation shall conform to the following applicable codes, standards and regulations, latest editions:
  - 1. American Society for Testing and Materials (ASTM)
  - 2. American National Standard Institute (ANSI)
  - 3. Underwriter's Laboratories, Inc. (UL)
  - 4. American Welding Society Code (AWSC)
  - 5. NFPA 70, "National Electrical Code", latest edition
  - 6. National Electrical Manufacturer's Association (NEMA).
  - 7. Occupational Safety and Health Act (OSHA).
  - 8. National Fire Protection Association (NFPA).
  - 9. National Electrical Safety Code (NESC)
  - 10. North Carolina State Building Code. (NCSBC)
  - 11. Institute of Electrical and Electronics Engineers (IEEE)
  - 12. Illuminating Engineering Society of North American (IESNA)
  - 13. State and Local Building, Electric, and Fire Codes and Regulations.

#### 1.17 PAINTING

- A. Cabinet trims and similar prefabricated equipment shall be factory primed and finish painted with baked enamel in color selected. This equipment shall not be painted in the field unless the factory finishes have been marred or as otherwise directed. Do not paint over UL or similar labels or mechanical/electrical nameplates.
- B. Exposed conduit visible to the public shall be painted to match adjacent finish. Prime conduits for better adhesion of paint.

#### 1.18 COORDINATION OF WORK

- A. Coordinate installation of conduit runs and equipment with other trades and conditions in the building and participate in all coordinated shop drawings. Variance from work shown on drawings will be subject to approval. Where interference occurs and electrical work is directed to be relocated, provide such relocation without additional cost.

#### 1.19 LOCATION OF OUTLETS

- A. Examine all architectural and vendor drawings before locating outlets. Place outlets as required to harmonize with moldings, panels, cabinets, mirrors, etc. Do not scale dimensions on electrical drawings but use measurements from architectural drawings.
- B. If an outlet is installed in such a location as to be out of proper relation to beams, walls, or other details of the building, relocate the outlet as directed. A relocation allowance of 10 ft. shall be understood by the Contractor with no extra cost to the Owner.
- C. Unless otherwise indicated, outlet boxes in walls shall be located with center line at the following elevation above the Finish floor line. Verify with Contractor for General Construction, all heights prior to actual layout of work.
  - 1. Switch Outlets 3 feet - 10 inches
  - 2. Bracket Outlets (Stairs) 7 feet - 0 inches
  - 3. Bracket Outlets (Other) 6 feet - 6 inches
  - 4. Telephone Outlets (Wall) 4 feet - 1 inch
  - 5. Telephone and Data Outlets (Other) 1 foot - 6 inches. Unless otherwise noted
  - 6. Receptacle Outlets 1 foot - 6 inches. Unless otherwise noted.
  - 7. Receptacle Outlets 3 feet - 0 inches in Mechanical Rooms
  - 10. Motor Starters and Safety Switches 4 feet - 0 inches to 6 feet - 0 inches as required
  - 11. Panel Boards (top) 6 feet - 0 inches

#### 1.20 ACCESS PANELS

- A. Furnish access panels where required, to concealed pull boxes, junction boxes, or similar equipment located above dry wall board ceiling or behind walls. Installation of access panels shall be by mechanic of the pertinent trade under General Construction.
- B. Access panels shall be 18" x 18" minimum, 16 gage wall or ceiling frame and a 14-gage panel door with not less than 1/8" fire proofing secured to the inside of the door. The door shall be provided with concealed hinges and cylinder lock, and prime-coated steel prepared for painting. Each door shall be capable of opening 180 degrees. Doors for wall panels shall be secured with suitable clips and counter sunk tamperproof screws.

- C. Access panels shall have "label" fire rating equal to the ceiling or wall surface.

#### 1.21 WARRANTY

- A. The contractor and equipment manufacturers shall jointly guarantee all wiring and equipment to be free of defects in workmanship and material for a period of one year from the date of final acceptance, unless otherwise noted.

#### 1.22 PROJECT RECORD DOCUMENTS

- A. Maintain at job site, one copy of record documents and samples as required under the General Conditions of the Contract, including Drawings, Specifications, Addenda and Bulletins, Change Orders, Shop Drawings, Product Data and Samples, Field Orders, Field Test Records and Maintenance and Operating Manuals.
- B. Provide files and racks for storage of documents. Maintain documents in a clean, dry legible condition and in good order. Do not use record documents for construction purposes. Make record documents and samples available during normal working hours for inspection.
- C. Recording:
  - 1. Label each document "Project Record" in neat large letters and provide final completion date.
  - 2. Record information concurrently with construction progress.
  - 3. Do not conceal any work until required information is recorded.
- D. Record Drawings - legibly mark to record actual construction as follows:
  - 1. A print set (blue-line or black-line) of contract drawing or shop drawing mark-ups of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawing are used for mark-up, record a cross reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variation in separate categories or work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work which would be difficult to measure and record at a later date. Note related change order numbers where applicable.
- E. Record Specifications and Addenda, Bulletins, Requests for Information (RFI's) and Construction Clarification Sketches (CSK's) - legibly mark each Section to record:
  - 1. Any variations in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of options, and similar information work where it is concealed or cannot otherwise be readily discerned at a later date by direct observations. Note related record drawing information and product data, where applicable.
  - 2. Changes made by Field Order or by Change Order.
- F. Product Data: Maintain one copy of each product data submittal, and mark-up significant variation in actual work in comparison with submitted information.
  - 1. Include both variations in product as delivered to site, and variations from manufacturer's instruction and recommendations for installation.
  - 2. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observations. Note related change orders and mark-up of record drawings and specifications.

- G. Record Drawings Submittal at Project Completion: Organize record drawing sheets into manageable sets, bind with durable paper cover sheets and print suitable titles, dates and other identification on cover of each set. Transfer marking required by previous paragraphs to set of reproducible transparencies. Submit complete set of transparencies to the Design Professional and two sets of blue-line prints.
- H. Product Data Submittal at Project Completion: Submit three sets of marked-up product data submittals for record purposes that include resolution of all review notes and field revisions.
- I. Record Sample Submittals: Immediately prior to date of substantial completion Design Professional (and including Owner's personnel where desired) will meet with Contractor at site and will determine which if any of submitted samples maintained by Contractor during progress of work are to be transmitted to Owner for record purposes. Comply with Design Professionals instruction for packaging, identification marking, and delivery to Owner's sample storage space.
- J. Miscellaneous Record Submittals: Refer to other sections of these specification for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order properly identified and bound or filed, ready for continued use and reference. Submit to Architect/Engineer for Owner's records.
- K. Maintenance Manuals: Organize maintenance-and-operating manual information into three suitable sets of manageable size and bind into individual binders properly identified and indexed (thumb-tabbed). Include: emergency instructions; spare parts listing; warranties; wiring diagrams; recommended "turn-around" cycles; inspection and cleaning procedures; recommended frequency of testing, adjustment and any other maintenance requirements; shop drawings; product data; and similarly, applicable information. Bind each manual of each set-in heavy duty 2-inch, vinyl-covered ring binder, and include pocket folders for folded sheet information. Mark identification on both front and spine for each binder.

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END OF SECTION 26 00 00



## SECTION 26 00 10 – ELECTRICAL GENERAL PROVISIONS

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

#### 1.2 REFERENCES

- A. NCBCC: North Carolina Building Code Council.
- B. NCCSB: North Carolina State Building Code
- C. NEC: National Electrical Code (NFPA 70)

#### 1.3 QUALITY ASSURANCE

- A. See the General and Supplementary General Conditions and Division 1.
- B. Work shall be in accordance with the 2018 edition of the North Carolina State Building Code, and the 2017 edition of the National Electrical Code (NFPA 70).
- C. The Contractor shall be responsible for notifying the State Electrical Inspectors in the Construction Administration Section of the State Construction Office to schedule required inspections as work progresses.
- D. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- E. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- F. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted. Substitute material and equipment will not be deemed to be approved until notification is given in a written addendum prior to the bid date.
- G. All materials and equipment shall comply with NEMA 250 standard as follows:
  - 1. Interior Dry Locations in Production Areas: Type 12.
    - a. The Sound Stage is classified as Production Area.
  - 2. Interior Dry Locations in Non-Production Areas: Type 1.
  - 3. Exterior, Wet and Damp Locations: Type 3R.

#### 1.4 SUBMITTALS

- A. See General and Supplementary General Conditions & Division 1.

- B. Within twenty (20) days after notification of the award of the contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and materials, which he proposes to use. Items requiring submittal data for approval will be noted at this time. One electronic set of submittal data shall be provided in pdf format for approval.
- C. Each submittal shall bear the approval of the contractor indicating that he has reviewed the data and found it to meet the requirements of the drawings and specifications as well as space limitations and other project conditions, before submittal to the Engineer for review. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. All requirements, parameters, information, details and other information noted about submitted equipment in the specifications and on the drawings shall be specifically addressed in the submittal. Submittals that do not contain this information will be returned to the contractor for resubmittal. The same detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.
- D. Upon completion of the project, the Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. These drawings shall remain on the project for its duration and shall be updated at the time changes are made. Final payment will be contingent on receipt of these "Record Drawings."
- E. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data, and sufficient manufacturer's literature to operate and maintain all equipment.
- F. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.

#### 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- B. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground. Any broken, damaged or weather damaged material or equipment shall be removed from the project site and replaced at the contractor's expense before installation.
- C. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

#### 1.6 WORK CONDITIONS AND COORDINATION

- A. Safety switches built in to equipment shall be furnished by the contractor furnishing the equipment. The electrical contractor shall furnish safety switches not built in to equipment. The electrical contractor shall review the plans and specifications of other trades to verify whether safety switches are furnished with equipment.
- B. All starters shall be furnished by the contractor furnishing the equipment.
- C. The electrical contractor shall provide power wiring to, a termination point consisting of a junction box, trough or gutter, starter or safety switch. The electrical contractor shall also furnish junction boxes, troughs and gutters. Final connections of the raceways and wire from those termination points to the equipment,

except for food service equipment, shall be by the contractor furnishing the equipment. Final connections to food service equipment shall be by the electrical contractor.

- D. Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- E. All work shall be coordinated with other trades. Cutting of new work, due to this contractor's negligence, and subsequent patching shall be approved by the Architect/Engineer and shall be at this contractor's expense with no extra cost to the Owner.

## 1.7 GUARANTEE

- A. See the General and Supplementary General Conditions.
- B. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary contract documents to validate these warranties as required by the manufacturer and present them to the Owner.

## 1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment as suitable for purpose specified and shown, where such listing exists.

## PART 2 - PRODUCT

- 2.1 Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect/Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent thereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.

### 3.2 INSTALLATION

- A. All work shall be performed in a manner indicating proficiency in the trade.
- B. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- C. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. The

Architect/Engineer shall require written approval if cutting of primary structure is involved.

- D. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- E. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support equipment.
- F. Grounding:
  - 1. All grounding shall be in accordance with the requirements of the NEC.
  - 2. The main service shall be grounded with driven rods, to building steel (where available) and to the domestic metal water main where it enters the building.
  - 3. The secondary neutral of each dry type transformer shall be bonded to the conduit system, building steel (where available), the domestic metal water line and to transformer case.
  - 4. A grounding conductor sized per the latest edition of the NEC shall be installed in all raceways containing power conductors.

### 3.3 PERFORMANCE

- A. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.

### 3.4 ERECTION

- A. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or this Contractor shall provide anchor material and equipment.

### 3.5 ADJUST AND CLEAN

- A. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- B. Factory painted equipment shall not be repaired unless damaged areas exist. The manufacturer shall touch up these areas with a material suitable for the intended service so that the finish is equal to that provided. In no event shall nameplates be painted.
- C. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his contract, (in the presence of the Engineer).

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END OF SECTION 26 00 10

## SECTION 26 00 35 - ELECTRICAL TESTING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical Testing

#### 1.2 RELATED SECTIONS

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

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT AND MATERIALS

- A. Equipment for electrical testing.
  - 1. For feeder insulation testing provide a 500-volt cable insulation tester.
  - 2. For ground resistance testing, provide a ground resistance tester capable of accurately reading 0 to greater than 25 ohms.
  - 3. For ground fault testing of receptacles and circuit breakers provide equipment that will accurately produce and read a ground fault of 1mA through 20mA in 1mA increments at full line voltage.
  - 4. For measurement of effective ground fault current return paths of conduits under deduct alternate 'E1' where no equipment grounding conductors are present use a kelvin bridge type micro-ohm meter capable of injection up to 10 Amps. Maintenance/repair of ineffective ground-fault current paths between receptacles / terminal loads and the master ground bus bar is included. Acceptable maximum resistance values of ground fault current return paths depend on the overcurrent protective device ratings and their clearing times and shall be calculated as follows and noted in the Ground Fault Return Path Resistance Report for engineering review of each circuit: Nominal voltage to ground divided by (nominal overcurrent protection device ampacity multiplied by five). For example a 20A, 120V circuit shall have a maximum fault current return path resistance of  $120V / (20A \times 5) = 1.2 \text{ Ohms}$ . A 200A feeder with 120V to ground potential shall have a maximum fault current return path resistance of  $120V / (200A \times 5) = 0.12 \text{ Ohms}$ .
  - 5. During the final inspection, the contractor shall furnish a cable insulation tester and ground resistance meter and demonstrate to the Engineer the fall-of-potential method ground resistance measurements except in urban settings with no access to bare earth, where the clamp-on in-line method shall be used. At the time of inspection demonstrate also that panel feeders comply with the requirements stated in the above paragraphs. The contractor shall also furnish a True RMS clamp-on ammeter and voltmeter to take readings as requested by the Engineer and SCO personnel.
- B. Provide any miscellaneous material such as wire or cable, extension cords, insulating tape or materials, clamps, etc., to implement all testing procedures noted in this specification.

### PART 3 - EXECUTION

#### 3.1 FEEDER INSULATION RESISTANCE TESTING

- A. Test all current carrying phase conductors and neutrals as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt wire insulation tester. The testing procedures listed below shall be followed:

1. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG and smaller wire and 250,000 ohms or more for #4 AWG or larger wire, between phase and neutral conductors, and between phase and neutral conductors and the grounding conductor.
2. After all fixtures, devices and equipment are installed and all connections are completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a wire insulation tester 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 conductors from this neutral bar. He shall then test each one separately to the panel until the low readings are found.
3. The contractor shall correct the problems, reconnect and retest the wires until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
4. The contractor shall send a letter to the Engineer certifying that the above test has been done and tabulating the cable insulation readings for each panel. This shall be done at least four (4) days prior to final inspection.

### 3.2 GROUND SYSTEM TESTING

- A. Upon completion of installation the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where tests show resistance to ground is over 25 ohms, drive additional ground rods as necessary to reduce the ground resistance to 25 ohms or less. Retest to demonstrate that the resistance is less than or equal to 25 ohms.
- B. Upon completion of circuits and prior to AHJ inspection and energizing test ground fault return path resistances of feeders and branch circuits and record results for engineering review.

### 3.3 CIRCUIT BREAKER TESTS

- A. For services 1000 amperes and larger, perform the following tests on the service and distribution circuit breakers. A qualified factory technician at the job site shall perform testing. All readings shall be tabulated:
  1. Phase tripping tolerance. Adjust or replace circuit breakers until the settings are within 20% of UL tolerances.
  2. Trip time (per phase) in seconds.
  3. Instantaneous trip (in amperes) per phase.
  4. Insulation resistance (in Megohms) at 100 volts (phase-to-phase and line-to-line).
  5. Ground fault protection devices shall be performance tested on-site per NEC 230.95(C) by a factory-trained technician after installation and a test-certificate shall be provided to the engineer prior to energizing.
  6. The Energy-reducing Maintenance switch where required by NEC 240.87 shall be factory tested and a test certificate shall be provided.

### 3.4 DOCUMENTATION

- A. All tests specified shall be completely documented indicating time of day, date, temperature, instrument make and model, most recent calibration date and all pertinent test information.
- B. All required documentation of readings indicated above shall be submitted to the Engineer prior to, and as one prerequisite for, the final acceptance of the project.

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END OF SECTION 26 00 35

## SECTION 26 00 51 - UNDERGROUND DUCTS AND PULL BOXES

### 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. Ducts in direct-buried duct banks.
  - 2. Ducts in concrete-encased duct banks.
  - 3. Distribution cabinets and handhole accessories.
  - 4. Pullboxes and Pullbox accessories.
- B. Related Sections include the following:
  - 1. Division 26 Section "Grounding and Bonding" for grounding electrodes, counterpoise conductors, clamps and connectors for grounding metallic Pullbox and handhole accessories and testing of grounds.

#### 1.3 SUBMITTALS

- A. Product Data: For the following:
  - 1. Pullbox hardware.
  - 2. Conduit and ducts, including elbows, bell ends, bends, fittings, and solvent cement.
  - 3. Duct-bank materials, including spacers and miscellaneous components.
  - 4. Warning tape.
- B. Shop Drawings: Show fabrication and installation details for underground ducts and utility structures and include the following:
  - 1. For Pullboxes:
    - a. Duct sizes and locations of duct entries.
    - b. Reinforcement details.
    - c. Pullbox cover design.
    - d. AASHTO rating.
- C. Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to scale and show all bends and location of expansion fittings.
- D. Product Certificates: For concrete and steel used in underground precast Pullboxes, according to ASTM C 858.
- E. Product Test Reports: Indicate compliance of Pullboxes with ASTM C 857 and ASTM C 858, based on factory inspection.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories (Including Ducts for Communications and Telephone Service): 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 ANSI C2.
- C. Comply with NFPA 70.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store precast concrete units at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- B. Lift and support precast concrete units only at designated lifting or supporting points.

#### 1.6 PROJECT CONDITIONS

- A. 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 at least two weeks in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's written permission.
- B. Existing Rock: Removal of rock encountered during underground work and replacement with subsoil and 6" topsoil to maintain existing grading is included in this project.
- C. Restore any disturbed landscaping to original condition.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of ducts, pullboxes, and distribution cabinets with final arrangement of other utilities and site grading, as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into pullboxes and distribution cabinets with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and to ensure duct runs drain to gravel pits below pullboxes and distribution cabinets, and as approved by Engineer.
- C. Coordinate landscaping and grading with owner.
- D. Coordinate exact routing of new underground raceways with Engineer.

### PART 2 - PRODUCTS

#### 2.1 PRODUCTS AND 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. Underground Precast Concrete Utility Structures:
    - a. Christy Concrete Products, Inc.
    - b. Rotondo Precast/Old Castle.



- c. Utility Vault Co.
- d. Quazite Precast Products
- 2. Nonmetallic Ducts and Accessories:
  - a. Southern Pipe, Inc.
  - b. Carlon Electrical Products.
  - c. Cantex, Inc.
  - d. Certainteed Corp.; Pipe & Plastics Group.
  - e. Duraline

## 2.2 CONDUIT

- A. Conduit and fittings used above grade are specified in Division 26 Sections "Conduit" and "Boxes".

## 2.3 DUCTS

- A. Rigid Nonmetallic Conduit: HDPE Schedule 40 Nema TC-7 and UL 651A listed smoothwall conduit for electrical wiring in raceway.
- B. Rigid Nonmetallic Conduit: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
- C. Rigid Nonmetallic Conduit: NEMA TC 2, Type EPC-80-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Oversize Schedule 80 PVC conduits as required to maintain inner diameter of run.

## 2.4 HDPE DUCT FITTINGS

- A. Coupling for transition of HDPE duct to galvanized rigid conduit and intermediate metal conduit. Air and water tight coupling without reduction in inner diameter. Listed to UL514B standard for direct burial underground applications, HDPE conduit, and wet locations.

## 2.5 PRECAST PULLBOXES

- A. Precast Units: ASTM 478, with interlocking mating sections, complete with accessories, hardware, and features as indicated. Open bottom with concrete knockout panels for conduit entrance and sleeve for ground rod.
- B. Design and fabricate structure according to ASTM C 858.
- C. Minimum size: 17 inches wide, 30 inches long and 24 inches deep. Use larger size as needed for sweeps, pulling, conductor volume or as otherwise found necessary.
- D. Provide open bottom precast box on 12" deep compacted broken stone pit with coarse ~1" aggregate. Stack boxes for required depth.
- E. Structural Design Loading: ASTM C 857, Class A-16.
- F. Joint Sealant: Continuous extrusion of 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.
- G. Source Quality Control: Inspect structures according to ASTM C 1037.

- H. Unit, when buried, shall be designed to support AASHTO H10 loading.

## 2.6 ACCESSORIES

- A. Duct Spacers: Rigid PVC interlocking spacers, selected to provide minimum duct spacings and cover depths indicated while supporting ducts during concreting and backfilling; produced by the same manufacturer as the ducts.
- B. Pullbox Frames and Covers: Comply with AASHTO loading specified for Pullbox.
  - 1. Provide cast covers with cast-in legend: "ELECTRICAL".
  - 2. Special Covers: Recess on cover designed to accept finish material in paved areas.
- C. Grounding Materials: Comply with Division 26 Section "Grounding and Bonding."
- D. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and of adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- E. Warning Tape: Underground-line warning tape specified in Division 16 Section "Electrical Identification."

## 2.7 CONSTRUCTION MATERIALS

- A. Waterproofing: Provide "Composite Sheet Waterproofing."
- B. Dampproofing: Provide "Bituminous Dampproofing."
- C. Concrete: Use 3000-psi- (20.7-MPa-) minimum, 28-day compressive strength and 3/8-inch maximum aggregate size. Concrete and reinforcement are per Section 260045.

## PART 3 - EXECUTION

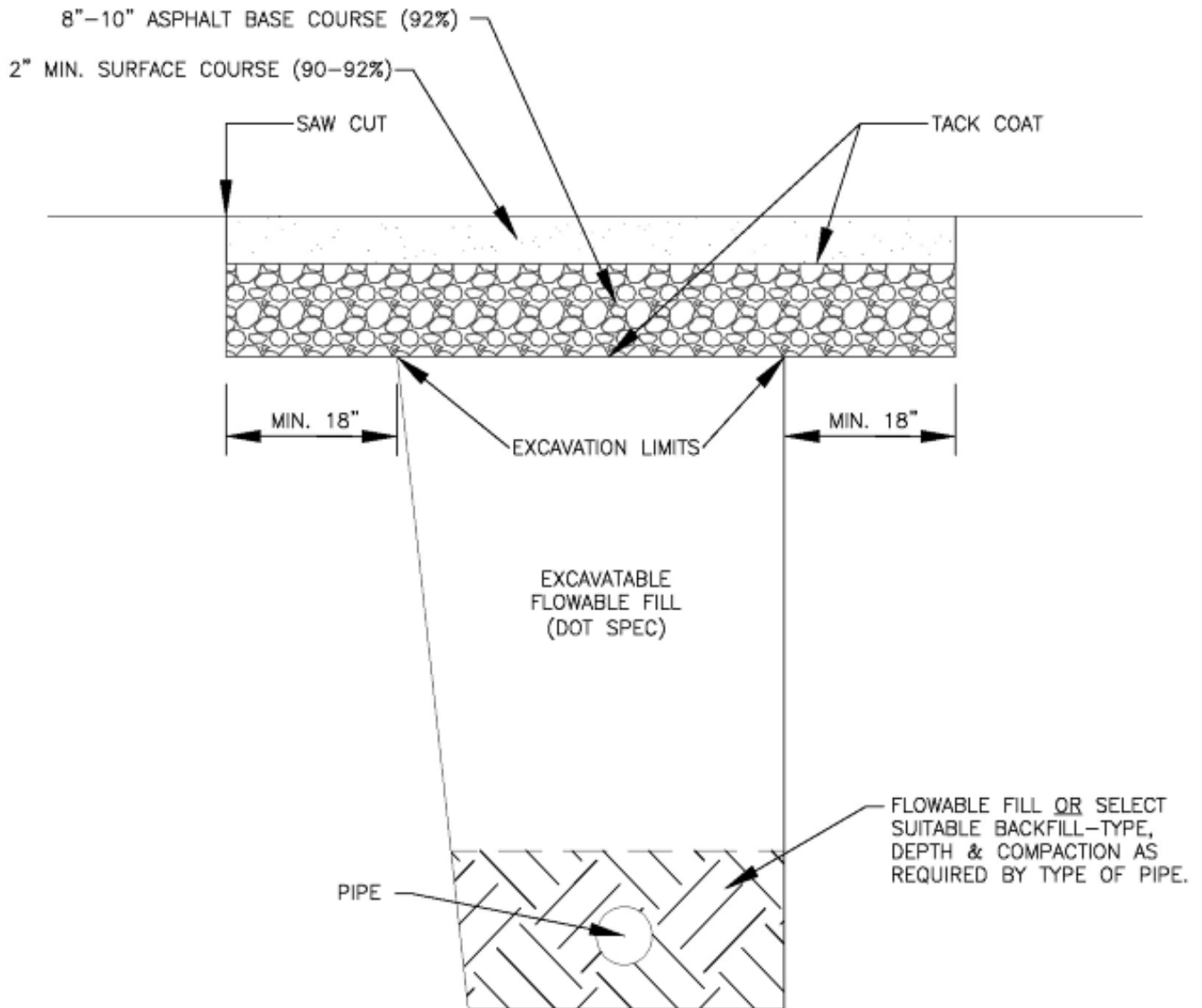
### 3.1 APPLICATION

- A. Ducts in soft shoulder, non-traffic areas: Direct buried underground HDPE Schedule 40 Nema TC-7 and UL 651A listed smoothwall conduit for electrical cable. Use Type EPC-40-PVC as required for utility power sleeves required by the utility company.
- B. Pullboxes: Underground precast polymer concrete utility structures set on 12-inch-deep crushed stone coarse fraction 3/4" to 1-1/2" aggregate pit.
- C. Direct buried vertical sweeps: Direct buried underground HDPE or PVC Schedule 80 Nema TC-7 and UL 651A listed smoothwall conduit for electrical cable.
- D. For underground runs less than 20' in length use NEMA TC 2, Type EPC-40-PVC or Type EPC-80-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Oversize Type EPC-80-PVC conduits as required to maintain inner diameters of runs.
- E. Exposed conduit stub-ups to daylight: IMC or RMC conduit.

### 3.2 EARTHWORK

- A. Excavation and Backfill: Comply with Division 31 Section "Earthwork". Do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore all 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.
- D. Cut and patch pavement for conduit installations below pavement not to exceed 100' in length. Transverse patches shall be overlaid across the entire width of the roadway. Patches shall be T-shaped in sectional profile extending a minimum of 2 feet on all sides of the excavation limit to allow for undisturbed benches to key the new pavement patch. Backfill and compaction shall be per NCDOT guidelines. Refer to Division 31 "Horizontal Directional Drilling" for trenches that would extend more than 100 feet.

## Street Cut Repair Detail Cross Section (All Repairs)



### GENERAL NOTES:

1. SAW CUT EDGES MUST BE STRAIGHT AND CLEAN.
2. PATCHES MUST BE REGULAR, SQUARE OR RECTANGULAR WITH (4 STRAIGHT SIDES).
3. FINAL SURFACE COURSE MUST BE FLUSH WITH THE EDGE OF EXISTING PAVEMENT, VERTICALLY AND HORIZONTALLY, WITH NO SPILLOVER OF ASPHALT OR TACK COAT.
4. CARE MUST BE TAKEN NOT TO DAMAGE INTEGRITY OR APPEARANCE OF SURROUNDING PAVEMENT. IF DAMAGED, THE ENTIRE SURFACE PATCH MUST BE EXPANDED TO COVER DAMAGES.
5. ALL STREET STRIPING IMPACTED BY THE REPAIRS MUST BE REPLACED TO NCDOT STANDARDS.
6. PROPER TRAFFIC CONTROL AND PLATING OF THE ROAD DURING CURE TIME FOR FLOWABLE FILL MUST BE CONDUCTED APPROPRIATELY AND TO CITY, STATE AND FEDERAL STANDARDS.
7. THE MAXIMUM TIME TO COMPLETE THE FULL REPAIR SHALL NOT EXCEED 10 WORKING DAYS.
8. FOR SMALLER REPAIRS, SURFACE ASPHALT MAY BE SUBSTITUTED FOR BASE COARSE, BUT MUST BE COMPACTED IN 2"-2.5" LIFTS.

### 3.3 CONDUIT AND DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward Pullboxes and away from equipment. Slope ducts from a high point in runs between two Pullboxes to drain in both directions.
- B. Curves and Bends: Follow manufacturer's recommendation for minimum bending radii and field-installation. For Fiber-optic cables do not use tighter than the cable manufacturer's published minimum bending radii.
- C. Duct entrances to Pullboxes: Stub-up conduits from below and through gravel beds. Extend min. 12" above gravel bed. Horizontal entry is not permitted to avoid filling of conduit.
  - 1. Reinforcement: Reinforce duct banks where they cross disturbed earth and where indicated.
  - 2. 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.
  - 3. Minimum Clearances between Ducts: 3 inches between ducts and exterior envelope wall and 4 inches between power and signal ducts.
  - 4. Depth: Install top of duct bank at least 18 inches below finished grade in nontraffic areas and at least 30 inches below finished grade in vehicular traffic areas, unless otherwise indicated.
- D. Direct-Buried Ducts: Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:
  - 1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts.
  - 2. Install expansion fittings as shown on Shop Drawings.
  - 3. Trench Bottom: Continuous, firm, and uniform support for duct bank. Prepare trench bottoms as specified in Division 2 Section "Earthwork" for pipes less than 6 inches in nominal diameter.
  - 4. Backfill: Install backfill as specified in Division 2 Section "Earthwork." After installing first tier of ducts, backfill and compact. Repeat backfilling 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, complete backfilling normally.
  - 5. Minimum Clearances between Ducts: 7-1/2 inches between ducts for like services and between power and signal ducts.
  - 6. Depth: Install top of duct bank per the NEC and at least 18 inches below finished grade.
- E. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank.
- F. Stub-ups: Use IMC, RMC for stub-ups to equipment. For equipment mounted on outdoor concrete bases, extend conduit a minimum of 12 inches from edge of base. Install insulated grounding bushings on terminations. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
- 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 ducts, including spares.

### 3.4 INTERFACES WITH EXISTING MANHOLES

- A. Follow OSHA safe entry protocol for manholes. Furnish all safety equipment including but not limited to ladders, tripods, lines, harnesses, radios and positive pressure ventilation.

- B. Protect existing installations from damage, concrete slip during ductbank pour and detritus.
- C. Pump dry manhole and maintain water level below sump. Clean bottom as needed for firm footing.
- D. Excavate to min. 6' below grade to enter manhole min. 5' below grade and as needed to maintain pitch. Refer to Dewatering Section 310913.
- E. Cut manhole wall to a flare for a positively engaged concrete plug with min. (6) 10' #5 rebar with a 6" bent J engaging the manhole wall and installed alongside ducts to take forces due to any settling of ductbank.
- F. Last 50' of ductbank and plug shall be in one monolithic pour.
- G. Ducts entering manholes shall have bell ends to facilitate cable pulls.
- H. Provide saddles and hardware to support cable loops min. 75% of the manhole's circumference or 16', whichever is longer. Loop, lay and strap cables to minimize strain.

### 3.5 PULLBOX INSTALLATION

- A. Elevation: Install Pullboxes with level cover. Stub collar  $\frac{1}{2}$ " above finished grade. Shape grade around box to not exceed 1 over 3 slope.
- B. Precast Concrete Pullbox Installation: Unless otherwise indicated, comply with ASTM C 891.
  - 1. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
  - 2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

### 3.6 FIELD QUALITY CONTROL

- A. Testing: Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
- B. Duct Integrity: Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of the duct. If obstructions are indicated, remove obstructions and retest.
- C. Correct installations if possible and retest to demonstrate compliance. Remove and replace defective products and retest.

### 3.7 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 Pullboxes and manholes. Remove soil and other foreign material.

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END OF SECTION 26 00 51

## SECTION 26 05 10 - LUMINAIRES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Interior and building-mounted exterior luminaries.
- B. Emergency lighting units.
- C. Exit signs.
- D. LED drivers
- E. LED lamps and luminaires
- F. Luminaire accessories.

#### 1.2 RELATED SECTIONS

- A. Section 26 01 30 Boxes.

#### 1.3 REFERENCES

- |    |       |                          |  |
|----|-------|--------------------------|--|
| A. | NCSCO | EELGD 3/2016             | Energy Efficient Lighting Guidance Document for New Construction and Retrofits issued by The State of North Carolina                                 |
| B. | NFPA  | 70                       | National Electrical Code (NEC)   |
| C. | NFPA  | 101                      | Life Safety Code   |
| D. | NCSEC | Energy Conservation Code | NC Energy Conservation Code  |
| E. | NCSBC | Building Code            | NC State Building Code   |
| F. | IES   | LM-79-08                 | Electrical and Photometric Measurements of Solid State Lighting Products   |
| G. | IES   | LM-80                    | Measuring Lumen Maintenance of LED Light Sources   |
| H. | IES   | LM-82                    | Method for the Characterization of LED Light Engines and Integrated LED Lamps for Electrical and Photometric Properties as a Function of Temperature |
| I. | IES   | LM-84                    | Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires  |
| J. | IES   | RP-16                    | Nomenclature and Definitions for Illuminating Engineering  |

K.	IES	TM-21	Projecting Long Term Lumen Maintenance of LED Sources
L.	IES	TM-28	Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaires
M.	IES	TM-30	IES Method for Evaluating Light Source Color Rendition
N.	NEMA	LSD 45	Recommendations for Solid State Lighting Sub Assembly Interfaces for Luminaires
O.	NEMA	SSL 7A	Phase Cut Dimming for Solid State Lighting: Basic Compatibility
P.	NEMA	410	Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts
Q.	NEMA	WD 6	Wiring Devices Dimensional Requirements
R.	ANSI/NEMA/ ANSLG	C78.377-	Specifications for the Chromaticity of Solid-State Lighting Products
S.	ANSI/ANSLG	C82.16 (anticipated)	Light Emitting Diode Drivers—Methods of Measurement
T.	ANSI	C82.15 (anticipated)	Robustness Testing for LED Drivers (need official title)
U.	ANSI	C82.77-10	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
V.	ANSI/IEEE	C62.41.1	IEEE Guide on the Surge Environment in Low-Voltage (1,000 V and Less) AC Power Circuits
W.	ANSI/IEEE	C62.41.2 IEEE	Recommended Practice on Characterization of Surges in Low-Voltage (1,000V and Less) AC Power Circuits
X.	ANSI/UL	1310	Standard for Safety of Class 2 Power Units
Y.	ANSI/UL	1598	Standard for Safety of Luminaires
Z.	ANSI/UL	1598C	Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits
AA.	ANSI/UL	8750	Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
BB.	ASHRAE	90.1	Energy Standard for Buildings Except for Low-Rise Residential Buildings



CC.	CIE	Pub. No. 13.3	Method of Measuring and Specifying Color Rendering of Light Sources
DD.	CIE	Pub. No. 15	Colorimetry
EE.	FCC	CFR Title 47 Part 15	Radio Frequency Devices
FF.	IEC	62301 ED.2.0 B:2011	Household electrical appliances—Measurement of standby power
GG.	IEC	62321 Ed. 1.0	Electrotechnical Products—Determination Of Levels Of Six Regulated Substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)
HH.	IEEE	PAR1789	IEEE Recommending Practices for Modulating Current in High Brightness LEDs for Mitigating Health Risks to Viewers

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 26 00 10.
- B. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data:
  - 1. Provide wiring diagram, dimensions, ratings, construction and performance data, including optical efficiency and ballast-lamp system efficiency in lumens per watt and compliance statement for surge protection.
- D. Samples:
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### 1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 26 00 10.
- Accurately record actual locations of each luminaire.

#### 1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 26 00 10.
- B. Maintenance Data: Include replacement parts list.

## 1.7 QUALIFICATIONS

- A. Manufacturer Criteria - Manufacturers shall be firms regularly engaged in the manufacture of lighting fixtures of types and ratings required, who have a service organization in the continental US, and whose products have been satisfactorily used in similar service for not less than 5 years. The manufacture of the fixtures shall comply with the provisions of all applicable code and standards. All fixtures shall be tested before shipping.

## 1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70, NFPA 101.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

## 1.9 EXTRA MATERIALS

- A. Furnish under provisions of Section 26 00 10.
- B. Provide two of each type of ballast and driver.

## 1.10 WARRANTY

- A. Minimum of five 10 years non-prorated warranty is required with each electronic ballast and LED luminaire including all components.
- B. LED arrays in the product(s) will be considered defective in material or workmanship if a total of 5% or more of the individual light-emitting diodes in the product(s) fail to illuminate during normal operation after installation.

# PART 2 - PRODUCTS

## 2.1 LUMINAIRES

- A. Furnish products as specified in the Lighting Fixture Schedule on plans.
- B. Substitutions: Under provisions of Section 26 00 10.
- C. Install drivers, LED assemblies, and specified accessories at factory.
- D. Flicker shall be 15% or less at full power output and dimming range down to 5%
- E. Each luminaire shall be designed to operate at an average operating temperature of 25°C.
- F. The operating temperature range shall be 0°C to 25°C.
- G. EMI/RFI
  - 1. Luminaires and associated on-board circuitry must meet Class A emission limits referred to in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI Emissions.
- H. Photometric & Colorimetric Performance

1. Photometric
    - a. Minimum initial delivered luminaire lumens
      - 1) Identify each type of fixture and the expected delivered luminaire lumens.
    - b. Minimum Luminaire Efficacy (LE) or Luminaire Efficacy Rating (LER):
      - 1) Energy Star and DLC certified products are a source of potentially acceptable luminous efficacy levels.
  2. Colorimetric
    - a. Correlated Color Temperature (CCT): Acceptable CCTs are 3500K,
    - b. Acceptable tolerances as provided in ANSI C78.377-2015 (LED)
    - c. Color Rendering Index (CRI) [Ra]  $\geq 80$  with a positive R9 value
    - d. Color shift of no less than  $\Delta u'v' < 0.007$  during the warranty period.
- I. Surge protection of LED / SSL luminaires
1. Furnish integral transient and surge protection to comply with ANSI C62.41-2002 Category A surge protection standards up to and including 2.5 kV, 5kA for interior fixtures.
- J. Thermal management of LED luminaires.
1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the design life.
  2. The LEDs manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient temperature.
  3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient temperature.
  4. The driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating temperature. Thermal management shall be passive by design. The use of fans or other mechanical cooling devices shall not be allowed.
- ## 2.2 BALLASTS
- A. LED Drivers:
1. Listed to UL 8750.
  2. Voltage: Match luminaire voltage.
  3. Inrush current: Limited to Table 2 "Peak Current Requirements with Pulse Widths not exceeding 2 ms duration" of the NEMA-410-2015 standard.
  4. Operation to be at standard rated voltage and ampacity of driver and driven SSL.
  5. LED Power Supply/Drive Robustness
    - a. Driver efficiency (at full load):
      - 1)  $\geq 85\%$  for drivers capable of  $\geq 50$  watts
      - 2)  $\geq 80\%$  for drivers capable of  $< 50$  watts
- ## 2.3 LAMPS
- A. Provide lamp type specified for luminaire and per the Light Fixture Schedule on drawings.
- B. Reflector Lamp Beam Patterns: ANSI C78.379.
- C. LED (SSL) Lamps
1. Product Testing:
    - a. Listed to comply with UL 1598 and UL 8750.
    - b. Tested to IES LM-79 and LM-80.

- D. Provide lamp type specified for luminaire.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrate and supporting grids for luminaires.
- B. Examine each luminaire to determine suitability for lamps specified.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install suspended luminaries using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- C. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- D. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings.
- E. Install accessories furnished with each luminaire.
- F. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 26 01 30.
- G. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Install specified lamps in each luminaire, emergency lighting unit and exit sign.

#### 3.3 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

#### 3.4 ADJUSTING

- A. Adjust Work under provisions of Section 26 00 10.
- B. Aim and adjust luminaires as indicated on Drawings or as directed.
- C. Adjust exit sign directional arrows as indicated.
- D. Re-lamp luminaries that have failed lamps at Substantial Completion.

#### 3.5 CLEANING

- A. Clean Work under provisions of Section 26 00 10.

- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

### 3.6 DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 26 00 10.
- B. Provide demonstration of luminaire operation with lighting controls elements such as dimmers.

### 3.7 TRAINING

- A. Provide 3<sup>rd</sup> party video-recorded not to exceed 2-hours for training of owner representatives covering components and operation of the lighting controls system.

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END OF SECTION 26 05 10

## SECTION 26 01 11 - CONDUIT

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetallic conduit.
- F. Fittings and conduit bodies.
- G. Electrical nonmetallic tubing.
- H. Surface metal raceway

#### 1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

#### 1.3 REFERENCES

- A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 National Electrical Code.
- E. NECA "Standard of Installation."
- F. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

#### 1.4 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

#### 1.5 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid tight flexible metal conduit, metallic tubing, nonmetallic conduit, nonmetallic tubing, fittings and conduit bodies.

## 1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 260010.
- B. Accurately record actual routing of conduits larger than 1½" inch.

## 1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment as suitable for purpose specified and shown, where such listing exists.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

## 1.9 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to roughin.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required completing wiring system.

# PART 2 - PRODUCTS

## 2.1 CONDUIT REQUIREMENTS

- A. Minimum Size: ½" trade size unless otherwise noted.

## 2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Intermediate Metal Conduit (IMC): Rigid steel.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel, plated, hexagonal, compression type fittings. Pot metal, setscrew or indenter type fittings will not be accepted.
- D. IMC and rigid conduit shall terminate with either a double locknut/bushing set, or in a threaded hub.

## 2.3 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel or aluminum construction.
- B. Fittings: ANSI/NEMA FB 1.

- C. Sizes: ½” and larger are acceptable for motor, appliance and fixture connections provided a green grounding conductor is installed. The grounding conductor and the flexible conduit size shall meet NEC requirements.

## 2.4 LIQUID TIGHT FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction with PVC jacket with integral copper grounding conductor.
- B. Fittings: ANSI/NEMA FB 1.
- C. Sizes: ½” and larger are acceptable for motor, appliance and fixture connections provided a green grounding conductor is installed. The grounding conductor and the flexible conduit size shall meet NEC requirements.

## 2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel, hexagonal compression, insulated throat type. Pot metal, setscrew or indenter type fittings shall not be used. Provide rain tight fittings in damp locations.
- C. Do not install in locations where EMT or fittings will be in contact with earth or underground (in or below slab on grade or in earth); any location where the tubing would be exposed to the elements; or where exposed to severe corrosive influence and/or severe physical damage.

## 2.6 NONMETALLIC CONDUIT

- A. Description: NEMA TC 2; Schedule 40 or 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

## 2.7 ELECTRICAL NONMETALLIC TUBING

- A. Description: NEMA TC 2.
- B. Fittings and conduit bodies: NEMA TC 3.

# PART 3 - EXECUTION

## 3.1 CONDUIT USES

- A. Underground Installations:
  - 1. Outside of Foundation Wall (with the exception of branch circuit raceways): Use a type approved by the NEC as “suitable for concrete encasement”, with a minimum of three (3) inches of concrete on all sides, and a minimum cover of eighteen (18) inches, except for circuits with voltages above 600 volts, which shall have a minimum cover of thirty (30) inches.
- B. Branch circuits run underground external to building foundation walls shall be run in raceways installed in accordance with the NEC and shall be of a type approved by the NEC as “suitable for direct burial.” Minimum raceway size shall be 3/4 inch.



- C. Raceways run underground internal to building foundation walls shall be of a type and installed in a method approved by the NEC.
- D. Where underground raceways are required to turn up into cabinets, equipment, etc., the elbow required and the stubup out of the slab shall be of RMC conduit oversized for same or greater inner diameter as the lateral run. Provide all required transition fittings. Where underground raceways are required to turn up on to poles, walls or other exposed structures subject to physical impact provide rigid steel conduit.
- E. Outdoor Locations, Above Grade: Use rigid steel or intermediate metal conduit.
- F. Wet and Damp Locations: Use rigid steel or intermediate metal conduit.
- G. Underground raceways shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
- H. Dry Locations:
  - 1. Concealed: Use rigid steel or intermediate metal conduit, or electrical metallic tubing.
  - 2. Exposed below 8'0" AFF or to severe physical damage: Use rigid steel or intermediate metal conduit.
  - 3. Exposed above 8'0" AFF and not exposed to severe physical damage in unfinished spaces: Use rigid steel or intermediate metal conduit, or electrical metallic tubing .
  - 4. In finished spaces provide surface metal raceway. In areas below 8'0" provide (2) profiled manufacturer recommended straps for each continuous section of raceway. Coordinate color selection w/ owner.

### 3.2 INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Install non-metallic conduit in accordance with manufacturer's instructions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, layin adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 260190.
- G. Do not support conduit with wire or perforated pipe straps. Remove temporary supports.
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed and concealed conduit parallel and perpendicular to beams, walls and floors.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Route conduit in and under slab from point-to-point.

- M. Maintain adequate clearance between conduit and piping.
- N. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- O. Cut conduit square using saw or pipe cutter; deburr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Join nonmetallic conduit using cement as recommended by manufacturer. Prepare areas to be joined with appropriate cleaner before applying cement. Wipe non-metallic conduit dry and clean before joining.  
  
Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- R. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- S. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
- V. Provide suitable pull string, minimum 200-pound breaking strength, in each empty conduit except sleeves and nipples.
- W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- X. Ground and bond conduit under provisions of Section 260170.
- Y. Identify conduit under provisions of Section 260195.
- Z. Where raceways pass through a "below grade" wall from a conditioned interior building space, said raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" throughwall fitting with "FSKA" membrane clamp adapter, if required.
- AA. Terminate IMC or rigid conduit with a double locknut/bushing set or in a threaded hub.
- BB. Where concentric, eccentric or oversize knockouts are encountered while terminating conduit of any type, a bonding bushing shall be installed.
- CC. Limit the use of "LBs" to locations only absolutely necessary. Where "LBs" are used, install mogul units above 2-inch.
- DD. Supports for conduit systems shall conform to NEC minimum support requirements.
- EE. Provide a NEC sized green grounding conductor in all conduits.
- FF. Preferred method of installation in finished areas is concealed installation. Cutting and patching of existing surfaces for concealed installation is included. Where permitted by and coordinated with Architect, surface metal raceway may be installed.

### 3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.

### 3.2 PAINTING

- A. Prime and paint raceway to match adjacent finishes in finished areas.

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END OF SECTION 26 01 11

## SECTION 26 01 23 - BUILDING WIRE AND CABLE

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Wiring connectors and connections.

#### 1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

#### 1.3 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

#### 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

#### 1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

#### 1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductors shall be copper.
- C. Wire routing shown on Drawings is approximate unless dimensioned. Route wire as required meeting Project Conditions.
- D. Where wire routing is not shown, and destination only is indicated, determine exact routing and lengths required.

#### 1.8 COORDINATION

- A. Coordinate Work under provisions of Section 260010.

## PART 2 - PRODUCTS

### 2.1 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Insulation Voltage Rating: 600 volts.
- C. Insulation: ANSI/NFPA 70; Type XHHW or THWN/THHN insulation for feeders and branch circuits.
- D. Color Coding:

<u>Phase</u>	<u>208Y/120V</u>	<u>277/480V</u>
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Natural Gray
Ground	Green	Green

- E. Wire types and sizes required in other specification sections shall supersede this section.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire has been completed.

### 3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

### 3.3 WIRING METHODS

- A. All wiring shall be in raceway.
- B. Install a code-gauge green insulated grounding conductor in all raceways.

### 3.4 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use solid conductors for feeders and branch circuits #10 AWG and smaller. Use Class B stranded conductors #8 AWG and larger.
- C. Use stranded conductors for control circuits.
- D. Use conductors not smaller than 12 AWG for power circuits.
- E. Use conductors not smaller than 14 AWG for control circuits.

- F. Use conductors not larger than 500 kCMIL.
- G. Use 10 AWG conductors to the first outlet for 20 ampere, 120-volt branch circuits longer than 50 feet.
- H. Use 10 AWG conductors to the first outlet for 20 ampere, 277-volt branch circuits longer than 125 feet.
- I. Pull all conductors into raceway at same time.
- J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- K. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- L. Clean conductor surfaces before installing lugs and connectors.
- M. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- N. Joints in solid conductors shall be made using Ideal "Wirenuts, 3M Company "Scotchlocks", T&B "Piggy" or other approved insulated spring, with plastic cap, twist-on connector.
- O. Joints in stranded conductors shall be made using approved mechanical connectors and gum rubber or friction tape with an outer covering of two layers of plastic tape equal to Scotch "33+". Solderless mechanical connectors for splices and taps, provided with UL approved insulating covers, may be used in place of mechanical connectors and tape.
- P. "StaKon" or other permanent type crimp connectors shall not be used for branch circuit connections.
- Q. Voltage Drop
  - 1. Where the conductor length from the panel to the first outlet on a 277-volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.
  - 2. Where the conductor length from the panel to the first outlet on a 120-volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.

### 3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire under provisions of Section 260195.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

### 3.7 TESTING

- A. Feeder Insulation Resistance Testing
  - 1. Test all current carrying phase conductors and neutrals as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt cable insulation tester. The testing procedures listed below shall be followed:

- B. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG and smaller wire and 250,000 ohms or more for #4 AWG or larger wire, between phase and neutral conductors, and between phase and neutral conductors and the grounding conductor.
- C. After all devices and equipment are installed and all connections are completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a cable insulation tester 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 conductors from this neutral bar. He shall then test each one separately to the panel until the low readings are found. The contractor shall correct the problems, reconnect and retest the wires until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
- D. The contractor shall send a letter to the Engineer certifying that the above test has been done and tabulating the cable insulation tester readings for each panel. This shall be done at least four (4) days prior to final inspection.
- E. Ground System Testing
  - 1. Upon completion of installation of the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where tests show resistance to ground is over 25 ohms, drive additional ground rods as necessary to reduce the ground resistance to 25 ohms or less. Retest to demonstrate that the resistance is less than or equal to 25 ohms.
- F. Documentation
  - 1. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
  - 2. At the final inspection, the contractor shall furnish a megger and show the Engineer and local AHJ that the panels comply with the above requirements. He will also furnish a clamp-on type ammeter and a voltmeter and take current and voltage readings as directed by the Engineer and AHJ.
  - 3. All required documentation of readings indicated above shall be submitted to the Engineer prior to, and as one prerequisite for, the final acceptance of the project.

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END OF SECTION 26 01 23

## SECTION 26 01 70 - GROUNDING AND BONDING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

#### 1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

#### 1.3 SCOPE

- A. Verify and bring existing conditions into compliance with the grounding and bonding specified in this section.

#### 1.4 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code.

#### 1.5 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Rod electrode.

#### 1.6 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 25 ohms.

#### 1.7 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.



## 1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

## PART 2 - PRODUCTS

### 2.1 ROD ELECTRODE

- A. Material: Copper clad steel.
- B. Diameter: 3/4 inch.
- C. Length: 10 feet.

### 2.2 MECHANICAL CONNECTORS

- A. Material: Bronze.

### 2.3 WIRE

- A. Material: Stranded copper.
- B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

### 3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Provide bonding to meet Regulatory Requirements.
- D. Equipment Grounding Conductor: Provide a separate, green insulated conductor within each raceway, sized per NEC Table 250-122. Terminate each end on suitable lug, bus, or bushing.
- E. Where conduits are terminated in concentric, eccentric or oversize knockouts, terminate conduit with a bonding bushing and a green or bare grounding jumper, sized per NEC Table 250.102(C)(1)95, to the ground bar.

### 3.3 SERVICE GROUNDING

- A. The electrical service shall be grounded by three (3) means:
  - 1. To the metallic cold-water pipe, as per NEC Article 250-50.

2. To the steel frame of the building, provided the building frame is effectively grounded.
3. To ground rod(s). Ground rods shall be 10 feet long and 3/4 inch in diameter and shall be of copper-clad steel construction.
4. All ground connections shall be accessible.

#### 3.4 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with Section 260123 Building Wire and Cable.

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END OF SECTION 26 01 70

## SECTION 26 01 95 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

#### 1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

#### 1.3 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

### PART 2 - PRODUCTS

#### 2.1 NAMEPLATES AND LABELS

- A. Nameplates: Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification of equipment, controlled, served, phase, voltage, etc. Nameplates shall be securely attached to equipment with pop-rivets of suitable material and size, and shall identify equipment controlled, attached, etc. Letters shall be 1/2-inch-high minimum. Embossed and printed self-adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:
  - 1. Fire Alarm System: Bright red surface with white core
  - 2. Telephone/Data System: Orange surface with white core
  - 3. Sound System: Dark Blue with white core
  - 4. Security System: Dark red (burgundy) surface with white core
  - 5. Emergency System: Green surface with white core
  - 6. Data Systems: Brown surface with white core

- |                      |                                |
|----------------------|--------------------------------|
| 7. Paging System:    | White surface with black core  |
| 8. TV System:        | Purple surface with white core |
| 9. 208 Volt System:  | Blue surface with white core   |
| 10. 480 Volt System: | Black surface with white core  |

B. Locations:

1. Each safety switch, panelboard, transformer, switchboard, main feeder circuit breakers and other electrical equipment supplied for the project. Information on the nameplate shall include equipment controlled and/or served, phase and voltage.

C. Letter Size: Minimum of 1/2 inch.

D. Labels: Printed adhesive tape, with 3/8-inch black letters on transparent background. Use only for identification of individual wall switches and receptacles with their corresponding electrical panel and breaker numbers.

E. Label Information: Equipment controlled and/or served - voltage, phase, etc.

## 2.2 WIRE MARKERS

A. Description: Cloth, tape, split sleeve, or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

## 2.3 CONDUIT MARKERS

A. Location: Furnish markers for each conduit longer than 20 feet.

B. Color:

- |                           |                     |
|---------------------------|---------------------|
| 1. Fire Alarm System:     | Bright Red.         |
| 2. Telephone/Data System: | Orange              |
| 3. Sound System:          | Dark Blue.          |
| 4. Security               | Dark Red (Burgundy) |
| 5. Emergency Systems      | Green               |
| 6. Data Systems           | Brown               |
| 7. Paging Systems         | White               |
| 8. TV Systems:            | Purple              |
| 9. 208 Volt System:       | Blue.               |
| 10. 480 Volt System:      | Black.              |

C. As an alternative to the above requirements, conduit in unfinished areas may be marked with spray paint.

D. Empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.

## 2.4 UNDERGROUND WARNING TAPE

- A. Description: 6-inch-wide, 4 mils thick, plastic tape, detectable type, bright colored with suitable warning legend, continuously printed, describing buried electrical lines.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

#### 3.2 APPLICATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplate to equipment front using self-tapping stainless-steel screws.
- C. Paint colored band on each conduit longer than 20 feet, 20 feet on center.
- D. Junction and pull boxes in conduit runs shall have their covers and exterior surfaces painted to match the colors in 2.3B above. This includes covers on boxes above lift-out and other type accessible ceilings.
- E. Identify all underground conduits using underground warning tape. Install one tape per trench at 6 to 8 inches below finished grade.
- F. Empty conduits and conduits with conductors, for future use shall be identified for use and shall indicate on each end where they terminate. Identification shall be by tags with string or wire attached to the conduit or outlet.

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END OF SECTION 26 01 95

**DIVISION 31**

**EARTHWORK**



**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. The work of this section consists of removal and disposal of structures, old pavements, abandoned pipelines, and other obstructions as designated, including salvaging of materials and backfilling of resulting trenches, holes and pits. Also included is all work, which relates to explosives including receiving, handling, transporting, storing, distributing, priming, loading, firing, and disposal.

**1.02 RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 of the Specification and Addenda apply to this section.

**PART 2: NOT USED****PART 3: EXECUTION****3.01 DEMOLITION**

A. BITUMINOUS PAVED AREAS

Scarify and completely remove. Resultant material may be utilized in bottom portion of areas to receive fill. No pieces shall be left exposed in the fill slopes. If material is used in any portion of the new construction, layers shall be a maximum of 8" and separated by minimum 6" layers of earth. Water and compaction requirements are specified under other sections. No compaction is required for materials used for obliteration work outside the limits of new construction.

B. REMOVAL OF CONCRETE SURFACES AND STRUCTURES

Concrete designed for removal, break into pieces and use for rip-rap. Volume, minimum 0.5 cubic foot; 75% of pieces shall be between 1.5 and 2.0 cubic feet. Stockpile at designated locations.

C. PIPE REMOVAL

Remove pipe, exercising care to avoid breaking or damaging. Store pipe to be re-laid as directed.

### 3.02

## **EXPLOSIVES**

### A. LEGAL REQUIREMENTS

Comply with all applicable Federal, State, and local laws and regulations pertaining to the use, storage, and handling of explosives. It is the intent of these specifications to comply with such laws and regulations. In the event of inconsistencies between these specifications and the laws and regulations, the laws and regulations take precedence, subject to final determination by the Engineer.

### B. PROTECTION

The Contractor shall exercise the utmost care not to endanger life and property. Make proper use of blasting mats and other protective devices adopting whatever additional precautions are deemed necessary to prevent damage to trees, shrubs, other landscape features, buildings, utilities, monuments, and other structures. Make every effort to prevent damage to the natural and the constructed surroundings. Should damage occur, make restoration as required by the Engineer.

### C. PERSONNEL

One competent, experienced person shall be specifically designated in charge of explosives. The designated person must present certification to the Engineer that he has successfully completed a course in the handling and use of explosives, given by an accredited institution such as the U.S. Bureau of Mines, DuPont, or other explosive manufacturing company. He shall exercise careful supervision of all work related to the use, storage, and handling of explosives. Permit only a minimum number of competent, experienced men, consistent with efficient operation, to handle explosives. Exclude anyone demonstrating carelessness, incompetence, or inexperience from further handling of explosives.

### D. GENERAL REQUIREMENTS

The Contractor shall give special attention to the following specific rules:

1. Locate magazines in accordance with the American Tale of Distances for Storage of Explosives and only at sites approved by the Engineer.
2. Magazines shall be bulletproof, fireproof, burglarproof, weather resistant, constructed with adequate screened ventilation and dry wood floors. Countersink all nails exposed to the interior of magazines.
3. Do not store detonators with other explosives but in separate magazines.
4. Magazines shall not be provided with artificial heat or lights.
5. Securely lock magazines.
6. Mark magazines and roads in area with appropriate caution and danger signs.



7. Clear blast area of unnecessary personnel and equipment before delivery of any explosives to the site.
8. Keep no more than a one-day supply of explosives at or near the work site. Keep explosives in approved portable magazines in locations approved by the Engineer.
9. Use only wooden tamping bars for charging explosives into drill holes.
10. Do not use electricity from light or power circuits for firing shots unless the electrical connection to the circuit is made within an enclosed switch box securely locked with switch in open position.
11. Provide a positive warning system to give adequate warning in every direction immediately prior to firing explosives. Guard all access points to the blast area to halt personnel and vehicles a safe distance from the blast. Maintain intercommunication between guards and person firing the blast assuring the blast area is clear prior to firing.
12. Provide special signs or signals at all access points including a warning to turn off radio transmitters whenever electrical detonators are used.

### **3.03 DISPOSAL**

- A. Dispose of debris from demolition operations in an approved and satisfactory manner.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

The work covered by this Section consists of the installation of an acceptable engineering fabric (filter fabric) appropriate for the application(s) called for on the plans. Placement of the fabric shall be an integral function of the construction of shoulder drains, subsurface drainage systems, temporary silt fences and placement of erosion control stone or rip rap facilities. The Contractor shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

**PART 2: PRODUCTS****2.01 MATERIALS**

Engineering fabric shall have material properties strictly conforming to those specified in Section 1056 of the "Standard Specifications for Roads and Structures" dated January 1, 2018, published by the North Carolina Department of Transportation. The Contractor shall provide engineering fabric(s) for various applications which meet or exceed the corresponding criteria for each different fabric utilized per the subject specification.

**PART 3: EXECUTION****3.01 INSTALLATION****A. GENERAL REQUIREMENTS**

1. Engineering fabric installed under erosion control stone or rip rap shall be placed at locations, to the dimensions as shown on the plans or as directed by the Engineer.
2. Surfaces to receive filter fabric shall be graded to the lines and grades as shown on the plans, unless otherwise directed by the Engineer. The surface shall be free of obstructions, debris and pockets of soft or low density material.
3. At the time of installation, the fabric shall be free of defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.
4. The filter fabric shall be laid smooth and free from tension, stress, folds, wrinkles, or creases. Horizontal overlaps shall be a minimum of 12 inches with the upper fabric overlapping the lower fabric. Vertical overlaps shall be a minimum of 18 inches with the upstream fabric overlapping the downstream fabric. In the event that the fabric is displaced or damaged during stone placement, the stone shall be

removed and the fabric repositioned or replaced prior to replacement of the stone, all at no additional cost to the Owner.

5. The placement of the filter fabric and stone shall be performed in a continuous manner as directed by the Engineer. The filter fabric shall be protected from damage due to the placement of stone or other materials by limiting the height of drop of the material or by placing a cushioning layer of sand on top of the fabric before dumping the material.
6. No more than 72 hours shall elapse from the time the fabric is unwrapped to the time the fabric is covered with stone or sand.
7. Filter fabric installed in association with shoulder drains or other subsurface drainage systems shall be installed in such a manner that all splice joints are provided with a minimum overlap of 2 feet. The overlap of the closure at the top of the trench shall be at least 6 inches and secured with mechanical ties. Where outlet pipe passes through the fabric, a separate piece of fabric shall be wrapped around the outlet pipe, flared against the side of the filled drain, and secured with anchor pins.
8. Field splices of filter fabric shall be anchored with anchor pins to insure that required overlap is maintained.
9. At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.
10. Aggregate placement operations and the pipe installation shall be done so as to prevent damage to the filter fabric. Damaged sections of filter fabric shall be replaced at no cost to the Owner.
11. The aggregate shall be compacted to a degree acceptable to the Engineer by the use of a vibratory compactor before making the filter fabric closure at the top of the trench.
12. Filter fabric installed in association with temporary silt fences shall be a water permeable filter type for the purpose of removing suspended particles from the water passing through it. Silt fences shall be constructed in accordance with Section 1605 of the "Standard Specifications for Roads and Structures" dated January 1, 2018, published by the North Carolina Department of Transportation in the locations and to the configurations as shown in the plans and as directed by the Engineer. Should the requirements of local, regional or state authorities having jurisdiction over the project exceed the requirements of this section or other sections in this specification regarding temporary silt fences, the more stringent shall govern.

**B. PHYSICAL PROPERTIES OF ENGINEERING FABRICS**

<b>PHYSICAL PROPERTIES OF ENGINEERING FABRICS</b>					
Physical Property	Test Method (Article 1056-2)	Type 1	Type 2	Type 3	
				Class A	Class B
Min. Roll Width	---	---	---	36"	36"
Min. Fabric Weight	1	4.0 oz/yd <sup>2</sup>	---	---	---
Min. Tensile Strength	2	90 lb.	200 lb.	50 lb.	100 lb.
Elongation	2	80% Max.	15% Min.	30% Max.	25% Max.
Min. Burst Strength	3	150 psi	400 psi	100 psi	180 psi
Min. Puncture Strength	4	45 lb.	80 lb.	30 lb.	60 lb.
Apparent Opening Opening Size - Max/Min (U.S. Std. Sieve)	5	60/100	30/130	20/50	20/50
Min. Ultra-Violet Exposure Strength Retention	6	80 lb.	140 lb.	40 lb.	80 lb.
Fungus Resistance	7	No Growth	No Growth	No Growth	No Growth
Min. Permeability (Thickness x Permittivity)	8	0.2 cm/sec.	---	---	---
Min. Flow Rate	8	---	---	10 gal/min/ft <sup>2</sup>	10 gal/min/ft <sup>2</sup>
Typical Application	--	Shoulder Drain	Under Riprap	Temporary Silt Fence	

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. The work covered by this section consists of the disposal of waste and debris in accordance with the requirements of these specifications. Waste will be considered to be all excavated, grubbed or removed materials, which are not utilized in the construction of the project.

**PART 2: NOT USED****PART 3: EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. Waste shall be disposed of in areas that are outside of the project area and provided by the Contractor, unless otherwise required by the plans or special provisions or unless disposal within the project area is permitted by the Engineer.
- B. The Contractor shall maintain the earth surfaces of all waste areas, both during the work and until the completion of all seeding and mulching or other erosion control measures specified, in a manner which will effectively control erosion and siltation.
- C. The following requirements shall also be applicable to all waste or disposal areas other than active public waste or disposal areas:
  - 1. Rock waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practical, and shall be covered with a minimum 6" thick layer of earth material either from the project waste or from borrow.
  - 2. Earth waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practicable, but in no case will slopes steeper than 2:1 be permitted.
  - 3. Construction debris, grubbed debris and all broken pavement and masonry shall be covered with a minimum 6" thick layer of earth waste material from the project or borrow. The completed waste area shall be shaped as required above for disposal of earth waste.
  - 4. Seeding and mulching shall be performed over all earth or earth covered waste areas. The work of seeding and mulching shall be performed in accordance with Section 32 92 19 – Seeding and Mulching.

5. Where the Engineer has granted permission to dispose of waste and debris within the project, the Engineer will have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance of the completed project.

Disposal of waste or debris in active public waste or disposal areas will not be permitted without prior approval by the Engineer. Such disposal will not be permitted when, in the opinion of the Engineer, it will result in excessive siltation or pollution.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. Clearing and grubbing shall consist of the removal and satisfactory disposal of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, posts, fences, stubs, rubbish and all other objectionable matter resting on or protruding through the original ground surface and occurring within the construction limits or right-of-way of any excavation, borrow area, or embankment.

**PART 2: NOT USED****PART 3: EXECUTION****3.01 GENERAL**

- A. Clearing and grubbing operations shall be completed sufficiently in advance of grading operations as may be necessary to prevent any of the debris from the clearing and grubbing operations from interfering with the excavation or embankment operations. All work under this section shall be performed in a manner which will cause minimum soil erosion. The Contractor shall perform such erosion control work, temporary or permanent, as may be directed by the Engineer in order to satisfactorily minimize erosion resulting from clearing and grubbing operations.

- 1. Clearing:

- a. The work of clearing shall be performed within the limits established by the plans, specifications, or the Engineer.
- b. Clearing shall consist of the felling and cutting up, or the trimming of trees, and the satisfactory disposal of the trees and other vegetation together with the down timber, snags, brush and rubbish occurring within the areas to be cleared. Trees and other vegetation, except such individual trees, groups of trees, and vegetation, as may be indicated on the plans to be left standing, and all stumps, roots and brush in the areas to be cleared shall be cut off six inches above the original ground surface.
- c. Individual trees and groups of trees designated to be left standing within cleared areas shall be trimmed of all branches to such heights and in such manner as may be necessary to prevent interference

with construction operations. All limbs and branches required to be trimmed shall be neatly cut close to the whole of the tree or to main branches, and the cuts thus made shall be painted with an approved tree wound paint. Individual trees, groups of trees, and other vegetation, to be left standing shall be thoroughly protected from damage incident to construction operations by the erection of barriers or by such other means as the circumstances require.

- d. The Engineer will designate all areas of growth or individual trees which are to be preserved due to their desirability for landscape or erosion control purposes. When the trees to be preserved are located within the construction limits, they will be shown on the plans or designated by the Engineer.
- e. Clearing operations shall be conducted so as to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and so as to provide for the safety of employees and others. When such damages occur, all damaged areas shall be repaired, removed or otherwise resolved utilizing generally accepted practices at the Contractor's expense.

2. Grubbing:

- a. Grubbing shall consist of the removal and disposal of all stumps, roots and matted roots from all cleared areas, except as herein specified.
- b. In embankment areas, when the depth of embankment exceeds 3'-6" in height sound stumps shall be cut off not more than 6" above the existing ground level and not grubbed. Unsound or decayed stumps shall be removed to a depth of approximately two feet below the natural ground surface.
- c. All depressions excavated below the natural ground surface for or by the removal of stumps and roots shall be refilled with suitable material and compacted to make the surface conform to the surrounding ground surface.



3. Disposal of Cleared and Grubbed Material:

Saw logs, pulp wood, cord wood or other merchantable timber removed incidental to clearing and grubbing shall become the property of the Contractor. All combustible matter shall be deposited at locations approved by the Engineer. Combustible matter may be burned or may be disposed of as stated above. Debris shall not be burned unless written permission or permit is issued by the Fire Marshall having jurisdiction in the area if applicable. The Contractor shall adhere to all limitations and conditions set forth in the permit. Burning shall be done at such time and such manner as to prevent fire from spreading and to prevent any damage to adjacent cover and shall further be subject to all requirements of State or Federal Governments pertaining to the burning. Disposal by burning shall be kept under constant attendance until all fires have burned out or have been extinguished.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. This portion of the project includes the excavation, undercut excavating, grading, earthwork and compaction required as shown on the plans and all other associated miscellaneous items of earthwork construction, as shown on the plans. The Contractor shall furnish all materials, labor, equipment and incidental items necessary to complete this portion of the work as detailed on the plans and as called for in these Specifications.
  - 1. All classified excavation shall be in accordance with Section 226 of the "Standard Specifications for Roads and Structures" dated February 2018, published by the North Carolina Department of Transportation, unless otherwise directed herein.
  - 2. Site grading shall conform to the grades indicated by the finish contours on the plans. Where topsoil, pavement, gravel or crushed stone surfacing and other items are shown, rough grade shall be finished to such depth below finish grade as necessary to accommodate these items. All areas where structures are to be built on fill shall be stripped to such depth as necessary to remove turf, roots, organic matter and other objectionable materials.

**PART 2: PRODUCTS****2.01 MATERIALS**

- A. Topsoil shall be considered to mean original surface soil, typical of the area, which is capable of supporting native plant growth, and shall be free of large stones, roots, brush, waste, construction debris and other undesirable material or contamination.
- B. All fill used for site grading operations should consist of a clean (free of organics and debris) low plasticity soil (plasticity index less than 30).

**PART 3: EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. Construction stakeout will be provided by the Contractor. Exact locations and grade points are to be staked or fixed by the Contractor before construction. The Contractor shall not disturb any bench marks, reference stakes or property line monuments. In the event it becomes necessary to remove any bench mark,

reference stake or property line monument in the performance of the work, the Contractor shall reference such points in preparation for replacement. If any such points are disturbed or damaged, they shall be replaced by a North Carolina Registered Land Surveyor at the expense of the Contractor.

- B. Existing utility lines (either overhead or underground), sidewalks, fencing, pavement or other structures shown on the drawings, shown to the Contractor or mentioned in the plans and specifications shall be kept free of damage by the Contractor's operations. It shall be the responsibility of the Contractor to verify the existence and location of all underground utilities within the Project Site. The omission from or the inclusion of utility locations on the plans is not to be considered as the non-existence of or a definite location of existing underground utilities. Any existing construction damaged by the Contractor shall be restored to an equal condition as that existing at the time prior to damage, at the Contractor's expense. If any existing utility is inadvertently damaged during construction, the Contractor shall notify the utility, the Engineer and the Owner of said damaged utility at once so that emergency repairs may be made at the Contractor's expense and to the satisfaction of the party having jurisdiction of the utility.

### **3.02 CLASSIFIED EXCAVATION**

- A. Excavation is classified and includes all excavation to the required elevations. Excavation shall be classified as earth excavation (includes borrow and waste materials as required), trench rock excavation, mass rock excavation, undercut excavation. There shall be no additional payment made for earth excavation. Trench rock excavation, mass rock excavation and undercut excavation shall be paid at the unit prices as provided in the bid form. The Engineer should be notified immediately if rock is encountered. All excavated materials which are not required or suitable for fills shall be considered as waste and shall be disposed of off the Owner's property at the Contractor's expense.
- B. Earth excavation includes excavation of pavements and other obstructions visible on the surface, underground structures, utilities, and other items indicated to be demolished and removed in order to reach subgrade elevation; together with soils and other materials encountered that are not classified as trench rock excavation, mass rock excavation or undercut excavation.
- C. Trench rock excavation shall be considered any naturally occurring material which cannot be removed with a Caterpillar 225 backhoe or equal, equipped with rock teeth, and which requires for its removal drilling and blasting, or wedging or sledging and barring.
  - 1. In addition, classification as trench rock is only applicable when encountered, as described above, during the installation of storm drainage lines, water lines or services, sewer lines or services and associated

structures as represented on the design drawings. Where trench rock excavation is necessary, the Contractor shall excavate the same as near the neat lines of the trench as practicable and the Contractor shall take all due precautions in the pursuance of the work. The Contractor will be held strictly responsible for all injury to life and to public and private property.

2. Trench rock shall be removed from the applicable excavation to the following limits:
  - a. Trenches: The diameter of the pipe plus 8 inches on each side, extending 6 inches below the pipe wall and bell.
  - b. Structures: 12 inches beyond the vertical plane of the structure on all sides and on the bottom only to the depth necessary for proper installation.
3. Trench rock excavation includes removal and off-site disposal of rock material and obstructions encountered in trench excavations that cannot be removed without systematic drillings, blasting, or ripping; and backfilling with the specified compaction of the trench with suitable material.

D. Mass rock excavation shall be considered any naturally occurring material, in the opinion of the Engineer, cannot be removed with a Caterpillar D-9 or equal, equipped with a properly fitted single tooth ripper, or removed by a Caterpillar 225 backhoe or equal, equipped with rock teeth. Mass rock in the bottom of roadway cuts shall be excavated to a depth of one foot below the roadbed and ditches. Mass rock in building pad areas shall be excavated to a depth of one foot below finished grade, or as directed by the Engineer. Where mass rock excavation is necessary, the Contractor shall excavate the same as near the neat limits of excavation as practicable and the Contractor shall take all due precautions in the pursuance of the work. The Contractor will be held strictly responsible for all injury to life and to public and private property.

1. Mass rock excavation includes removal and off-site disposal of rock material and obstructions encountered in excavations that cannot be removed without systematic drillings, blasting, or ripping; and backfilling with the specified compaction of the undercut rock with suitable material.

E. Undercut excavation shall be any natural soil materials, not including topsoil, situated at or below the proposed subgrade elevation that is deemed unsuitable or undesirable in their location or condition as determined by a qualified Geotechnical Engineer, employed by the Owner. The Geotechnical Engineer may require that the Contractor remove this undesirable material and backfill with approved material properly compacted. Moisture content shall not be an acceptable means for declaring a soil unsuitable. It is the responsibility of the

contractor to properly condition the soil to an acceptable moisture content prior to use in grading operations.

1. Undercut excavation includes excavation and off-site disposal of undesirable material; any backfilling in the undercut area from an approved borrow source; and proper compaction of the borrow material. Topsoil, regardless of depth, shall not be classified as undercut excavation material and the replacement thereof shall be covered in the price for earth excavation as described above. Topsoil depth may be specified by the geotechnical report.
- F. Borrow material shall be suitable material from an approved off-site area that is required to; backfill undercut areas; bring the site to the proposed grades in the absence of sufficient material on-site; backfill trenches and other excavations as required. The borrow material shall be checked for suitability for compaction and approved by a qualified Geotechnical Engineer prior to placement on-site at the Contractor's expense. Borrow excavation shall be performed in accordance with Section 230 of the NCDOT Standard Specifications for Roads and Structures except where modified herein. All borrow material required shall be permitted, acquired and placed at the Contractor's sole expense. Borrow material required to bring the site to proposed grades in the absence of sufficient material on site shall be considered part of earth excavation and, therefore, no additional payment shall be made.
- G. The Contractor shall provide all sheeting, shoring, underpinning and bracing required to hold the sides of any excavation and for the protection of all adjacent structures. The Contractor shall be held responsible for any damage to any part of the work by failure of excavated sides or bottoms.

### **3.03 BLASTING**

- A. Any and all blasting operations shall be conducted in strict accordance with existing ordinances and regulations relative to storage and use of explosives. Blasting shall be done only by experienced and qualified personnel and extreme caution and care shall be exercised to prevent injury to persons or damage to any pipe, mains, wires, drains, buildings, railroad tracks or other property above or below the surface of the ground. The Contractor shall use safety nets or other equivalent measures as approved by the Engineer to reduce the possibility of flying rock as a result of blasting operations. The Contractor shall be held strictly responsible for any injury to persons or damage to public or private property.
- B. The Contractor shall submit blasting plans to the Engineer for review and shall not proceed with blasting operations until approval has been granted. As directed by the Engineer, blasting operations shall be monitored to insure that vibration levels produced by blasting are within tolerable limits.

- C. The Contractor shall obtain at his expense, all Federal, State and Local permits required to perform blasting operations.

### **3.04 DEWATERING**

The Contractor shall control the grading in all areas so that the surface of the ground will be properly sloped, diked or ditched to prevent water from entering into excavated areas. The Contractor shall maintain sufficient personnel and equipment to promptly and continuously remove all water, from any source, entering or accumulating in the excavation or other parts of the work. All water pumped or drained from these areas shall be disposed of in a suitable manner without damaging adjacent property or other work under construction.

### **3.05 EMBANKMENTS, FILLS, & BACKFILLS**

- A. Upon completion of the stripping operations, the exposed subgrade in areas to receive fill should be proof rolled with a loaded dump truck or similar pneumatic-tired vehicle with a minimum loaded weight of 20 tons, under the supervision of the geotechnical engineer. The proofrolling procedure should consist of four complete passes of the exposed areas with two of the passes being in a direction perpendicular to the preceding ones. Any areas which deflect, rut or pump excessively during the proofrolling or fail to "tighten up" after successive passes should be undercut to suitable soils and replaced with compacted fill.
- B. Embankments and fills shall be constructed at the locations and to the lines and grades indicated on the drawings. Material shall be placed in horizontal layers not to exceed 8 inches in loose depth and thoroughly compacted prior to placing each following layer. All fill material shall be free from roots or other organic material, trash, and from all stones having any one dimension greater than 6 inches. Stones larger than 4 inches, maximum dimension, shall not be permitted in the upper 6 inches of fill or embankment. Fill areas shall be kept level with graders or other approved devices. Fill shall not be placed on surfaces that are muddy, frozen, or contain frost or ice.
- C. Embankment and fill compaction shall be accomplished by thoroughly compacting each layer with sheep foot rollers, pneumatic rollers, and mechanical tampers in places inaccessible to rollers, or other equipment. When material has too much moisture, grading operations shall be limited to drying soil by spreading and turning for drying by the sun and aeration. When material is dry, moisture shall be added by sprinkling by approved means.
- D. Where natural slopes exceed 4:1, horizontal benches shall be cut to receive fill material. Slopes of less than 4:1 and other areas shall be scarified prior to placing fill material.

- E. All embankments and fills shall be compacted to the following percentages of the maximum dry density as determined by the Standard Proctor Density Test, ASTM D-698, Method C.
- F. The following table shall be used throughout the project unless otherwise directed by the Engineer:

TABLE OF COMPACTION

<u>Type Fill or Embankment</u>	<u>Zone</u>	<u>Minimum Density %</u>
Structures	All Depths	98
Paved Areas	All Depths	98
Yard or Field Areas	All Depths	95

- 1. Embankment types are defined as follows:

Structure- beneath concrete slabs of buildings, floors, foundations, etc.

Paved Areas- beneath all roads, tracks, runways, pads, streets, truck operations, and automobile parking lots.

- G. Where backfilling is required after the completion of drainage structures, all forms, trash, and construction debris shall be removed from excavation before backfilling begins. Backfill shall be placed in horizontal layers of 6 inches in loose depth. Compaction shall conform to requirements in the above table. Heavy rollers, crawler equipment, trucks or other heavy equipment shall not be used for compacting backfill within 5 feet of structure walls or other facilities which may be damaged by their weight or operation. No backfilling shall begin until concrete and masonry walls are properly cured.
- H. The Contractor shall carry the top of embankments, fills, or backfills to the surrounding grade so that upon compaction and subsequent settlement, the grade will be at proper elevation. Should settlement occur during the guarantee period of the contract, the Contractor shall provide sufficient fill to bring area up to finished grade and shall reseed as required.

### **3.06 PROOFROLLING**

- A. Proofrolling under the observation of the Soils Engineer will be performed using a loaded dump truck or similar pneumatic-tired vehicle with a minimum loaded weight of 20 tons as specified herein and as follows: The proofrolling procedure

should consist of four complete passes of the exposed areas with two of the passes being in a direction perpendicular to the preceding ones. Any areas which deflect, rut or pump excessively during the proofrolling or fail to "tighten up" after successive passes should be undercut to suitable soils and replaced with compacted fill.

- B. Immediately following stripping, all areas to receive fill shall be proof rolled as specified herein.
- C. Immediately following the completion of excavation to proposed grades in cut areas, proofrolling shall be performed as specified herein.
- D. Immediately prior to stone base course placement in pavement areas and following final floor slab preparation, all subgrade areas will be proof rolled. Any local areas which deflect, rut or pump under the roller shall be undercut and replaced with compacted fill material as specified herein. Undercut will not be paid for in fill areas where proof roll does not pass.

### **3.07 AIR POLLUTION**

- A. Comply with all pollution control rules, regulations, ordinances, and statutes which apply to any work performed under the Contract, including any air pollution control rules, regulations, ordinances and statutes, or any municipal regulations pertaining to air pollution.
- B. During the progress of the work, maintain the area of activity, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride or more effective dust control, furnish and spread the material, as directed, and without additional compensation.

### **3.08 SOIL INSPECTION AND TESTS**

- A. All excavated and fill material shall be removed, selected, placed and compacted under supervision of a representative of a commercial soils testing laboratory which will be selected by the Owner. A commercial soils testing laboratory shall be any firm properly equipped to perform such compaction tests and who has in their employment a Professional Engineer experienced in testing and soil mechanics. The laboratory representative shall have the authority to approve or disapprove the condition of the subgrade on which fill is to be placed, filled material, placement methods, compaction methods, and shall make compaction density tests as necessary to determine that the specified density is obtained. The Contractor shall notify the laboratory at least three (3) days prior to starting fill operations in order that suitability of material for compaction may be checked and no material shall be used that has not been previously checked and approved by the laboratory. The laboratory shall be notified before any cut is made or fill is



placed in order that the laboratory representative may be present during all grading operations. The Contractor shall remove, replace, recompact and retest all fills failing to meet the density requirements at no additional expense to the Owner.

- B. A soils testing laboratory shall be retained by the Owner to supervise fill placement and compaction at no expense to the Contractor. However, extra time and trips caused by excessive delay, failure of the Contractor to properly coordinate with the laboratory, or failure of the Contractor to properly compact fill material shall be back charged to the Contractor.
- C. Field density tests shall be performed by the Owner's testing agency for each one foot of fill material placed at the following frequency:
- D. A minimum of one field density test shall be made for each 2,000 square feet/vertical foot of fill placement in building areas.
- E. A minimum of one field density test shall be made for each 5,000 square feet/vertical foot of fill placement in all other areas where pavement is to be placed.
- F. Prior to final acceptance, the Soils Engineer and Surveyor shall submit certification specifying that the project compaction criteria and subgrade elevations have been satisfactorily obtained. The Contractor is responsible for the certification statement from the Surveyor. This certification should be in the form of a letter accompanied by a stamped as-built drawing showing spot elevations.

### **3.09 BORROW AND WASTE MATERIALS**

- A. Borrow:

In the event borrow material is required, the borrow material shall be checked for suitability for compaction and approved by the soils testing laboratory. The Contractor shall notify the laboratory at least three (3) days in advance of beginning borrow operations. Borrow excavation shall be performed in accordance with Section 230 of the NCDOT Standard Specifications for Roads and Structures except where modified herein. The Contractor shall be responsible for any erosion control, seeding, and stabilization of any borrow area regardless of whether such area is located on or off the Owners property.

B. Waste:

Excavated materials not suited for backfill and excavated material in excess of that needed to complete the work shall be hauled off the Owner's property at the Contractor's expense. The Contractor shall be responsible for any erosion control, seeding and stabilization at any waste site at no additional cost to the Owner. See section "31 10 05 - Waste Material Disposal."

**3.10 RESIDUAL SOIL AREAS**

If proofrolling indicates that on-site virgin soils supporting any roadway, parking, building or other structural areas are not adequate as determined by the Soils Engineer, then these unsuitable areas shall be classified as undercut and be repaired by the Contractor. The necessary repair procedure shall be determined by the Soils Engineer and may include scarifying, drying and recompaction procedures or undercutting and replacement procedures.

**3.11 FINAL GRADING**

- A. On completion of all grading, all graded areas (except building pads and pavement areas and all cut slopes steeper than 4:1 slope) shall be provided with 4 inches of topsoil and brought to the finished grades shown on the drawings. Areas disturbed by operations of the Contractor shall be properly returned to their original condition with a topsoil covering of 4 inches.
- B. After the entire graded area has been brought to the finished grades shown on drawings, all areas shall be left smooth and free from erosion, ridges, ditches and evidence of ponding. Final grades shall be free from all roots, debris, rock and soil lumps and left in readiness for seeding.
- C. Prior to acceptance of the entire project, the Contractor shall correct all embankments and graded areas of all damages due to washes, settlement, erosion, equipment ruts or any other cause at his expense.
- D. Prior to final acceptance, the Contractor shall provide certification as specified in paragraph 3.7.6 that all grades are  $\pm$  0.1 foot of the finished grades shown on project drawings.
- E. The Contractor shall stabilize all disturbed areas, unless otherwise directed, by seeding and mulching per section 32 32 00 of these specifications or other means of stabilization called for by the contract drawings.

### **3.11 CLEAN UP**

Upon completion or termination of the work, and before final payment is made, the Contractor shall remove from site all equipment, waste materials and rubbish resulting from his operations. In the event of his failure to do so, the same may be done by the Owner at the expense of the Contractor.

**END OF SECTION**

# **SECTION 31 23 00 EXCAVATING, BACKFILL, AND COMPACTING FOR UTILITIES & STRUCTURES**

## **PART 1: GENERAL**

### **1.01 SCOPE OF WORK**

- A. The Contractor shall furnish all labor, material, equipment, and supplies, and shall perform all earthwork for installation of utilities including excavation and backfill, pavement removal, sheathing, bracing, shoring, pumping or bailing, dewatering, restoration and cleanup; all as indicated, specified and/or necessary to complete the work.
- B. Any reference to NCDOT standard specifications was obtained from "Standard Specifications for Roads and Surfaces" published by the North Carolina Department of Transportation dated February 10, 2006. Unless otherwise noted, the most current date published applies.\
- C. Excavation for this project will be Classified excavation. Any earthwork that does not conform to earth excavation as defined in the 31 23 00- Grading specification shall be paid for per unit prices established in section 01 22 00 of the specifications.
- C. Related Work: Reference the following specifications for related work:
- 31 32 00 Site Stabilization  
32 01 00 Restoration of Surfaces

## **PART 2: PRODUCTS**

### **2.01 MATERIALS**

- A. Fill Material shall be classified as ML-low plasticity silt or better by the Unified Soil Classification System and tabulated below:

	UNIFIED CLASS	DESCRIPTION
CLASS I	GW	¼"- 1 ½" well graded stone including coral, slag, cinders, crushed stone & shell
CLASS II	GP	Coarse gravel, poorly graded
	SW	Coarse sands, well graded
	SP	Coarse sands, poorly graded
CLASS III	GM	Silt-y, sandy gravel
	SM	Silt-y sands
	SC	Clay-y sands

B. Backfill material shall exhibit a plasticity index of less than 20, and Standard Proctor maximum density at optimum moisture greater than 90 pounds per cubic foot.

C. The following materials are unacceptable:

	UNIFIED CLASS	DESCRIPTION
CLASS III	GC	Clay-y, sandy gravel
CLASS IV	CL	Inorganic clays- low plasticity
	MH	Inorganic elastic silts
	CH	Inorganic clays- high plasticity
	ML	Inorganic silts and fine sands
CLASS V	OL	Organic silts
	OH	Organic clays
	PT	Highly organic soil

D. Washed Stone: Stone material where indicated shall be crushed stone or gravel of strong, durable nature and shall conform to standard size No. 57 per NCDOT Section 1000.

E. Concrete: Minimum 28-day compressive strength of 3000 psi.

### **PART 3: EXECUTION**

#### **3.01 EXISTING FACILITIES**

A. Existing Utilities Shown on the Drawings: It shall be the Contractor's responsibility to conduct the work in such a manner as to avoid damage to or interference with any utilities services shown on the drawings. If such damage, interference, or interruption of service shall occur as a result of his work, then it shall be the Contractor's responsibility to promptly notify the Engineer of the occurrence and to repair or correct it immediately, at his own expense, and to the satisfaction of the Engineer and the Owner of the Utility.

B. Existing Utilities Not Shown on the Drawings: It shall be the Contractor's responsibility to exercise all reasonable precaution in the performance of the work to avoid damage to or interference with any utilities services, even though not shown on the drawings. If such damage, interference, or interruption of service shall occur as the result of this work, then the Contractor's responsibility will be the same as stipulated in Paragraph 3.1.A above.

### **3.02 EXISTING STREAMS**

- A. Exercise reasonable precaution to prevent the silting of streams. Provide at Contractor's expense temporary erosion and sediment control measures to prevent the silting of streams and existing drainage facilities. The Contractor shall size structures and conform fully with the North Carolina Sedimentation Pollution Control Act.

### **3.03 CLASSIFIED EXCAVATION AND BACKFILL – GENERAL REQUIREMENTS**

- A. Pavement, gutters, sidewalks, aprons and curbs which will be disturbed by excavation shall be removed and disposed of as a part of ordinary excavation. That which is to be removed shall be cut or sawn along clean straight lines from that which is to remain. Remove enough such that a minimum of twelve inches of undisturbed earth remain between the excavation and that which is to remain.
- B. Where required, and as approved by the Engineer, sheeting and bracing shall be used to prevent injury to persons, caving of trench walls and to conform with all governing laws and ordinances. Sheeting and bracing shall be left in place until the trench is refilled to a safe limit. The top portion may then be removed, but the lower portion shall remain undisturbed.
- C. Stability of Excavations:
  - 1. Slope sides of excavation to comply with local codes and ordinances having jurisdiction and in accordance with the requirement noted in the Geotechnical Report. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
  - 2. Maintain sides and slopes of excavations in safe conditions until completion of backfilling. Protect slopes from erosion by covering the slope with material such as polyethylene sheets.
- D. Dewatering:
  - 1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area
  - 2. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavation.

3. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches. Do not discharge drainage water lines into municipal sewers without municipal approval. Prevent water running onto adjacent properties and public thoroughfares. Direct surface drainage away from excavated areas.
4. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage.
5. The dewatering system shall be maintained until backfilling is completed or as otherwise directed by the Engineer. All damage resulting from the dewatering operation shall be repaired by the Contractor to the satisfaction of the Engineer and at no cost to the Owner.

E. Material Storage

1. Where required by schedule or site limitations, stockpile satisfactory soil materials and/or select fill where directed, until required for backfill or fill. Place, grade and shape stockpiles from proper drainage.
2. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain
3. Dispose of excess soil material and waste materials as herein specified

F. Excavation for Structures

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10'. Excavations for footings and mats may be neat excavated where possible with sides and top edges free of loose or wet materials. Where neat excavation is not possible, excavate by open cut and allow sufficient distance from the edge of footings and foundations to permit placing and removing concrete formwork, installing services, other construction, and for inspection.
2. In excavating for footings and foundation, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Where unsatisfactory bearing surfaces are encountered, the area shall be undercut as required and backfilled with cement stabilized sand or lean concrete as directed by the Geotechnical

Engineer. Trim bottoms to required lines and grades to leave solid, clean, level and flat base to receive other work.

3. Protect soils exposed at the base of completed foundation excavations against disturbance from construction activities and changes in moisture content. Excavations shall not be left overnight unless it is protected with a minimum 2" thick seal slab of lean concrete. Where the bottom of the excavation will be exposed to movement of crawler type heavy equipment, the contractor may leave about one foot of undisturbed soil above indicated bottom of footing elevation
  4. Mat excavation: the final one foot of mat excavation shall be performed over small areas and shall produce minimal disturbance to the bearing surface. As soon as the excavated area is cleaned, all loose material removed, and soft spots filled, the bearing area shall be immediately covered with a 3" unreinforced seal slab of lean concrete before proceeding to the next area of excavation.
- G. The Contractor shall erect, maintain, and safeguard temporary bridges, walkways, or crossings where it is necessary to maintain traffic. Where trenches are open in the vicinity of pedestrian or vehicular travel lanes, suitable carriers will be constructed and maintained and the work will be further protected from sunset to sunrise with a sufficient number of lights or flares to fully protect the public from accidents on account of construction. The Contractor shall maintain at a minimum a single lane of traffic during all construction activities at all times. The Contractor shall provide flaggers as necessary to safely direct and accommodate traffic during construction.
- H. If the specified depth for foundations proves insufficient to reach firm ground, the Engineer shall be notified and will furnish instructions for proceeding with the work.
- I. Rock, wherever used as a name for excavation material, shall refer to any naturally occurring material that cannot be removed with a Caterpillar D-9 or equal, equipped with a properly fitted single tooth ripper, or removed by a Caterpillar 225 backhoe or equal, equipped with rock teeth that requires for its removal drilling and blasting, or wedging or sledging and barring. Where rock excavation is necessary, the Contractor shall excavate the same as near the neat lines of the trench as practicable and he shall take all due precautions in the pursuance of the work. He will be held strictly responsible for all injury to life and to public and private property.
1. Rock shall be removed from the excavation to the following limits:
    - a. Trenches: The diameter of the pipe plus 8 inches on each side, extending 6 inches below the pipe wall and bell.



- b. Structures: 12 inches beyond the vertical plane of the structure on all sides and on the bottom only to the depth necessary for proper installation.

- J. Blasting: Prior to commencing any blasting operations the Contractor shall notify the Engineer and either the Local Fire Department - Fire Prevention Section or the County Fire Administrator (as applicable) and obtain blasting permits as required. The Contractor must furnish proof (certification) of insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

All blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances, laws as may be imposed by any regulatory body and/or agency having jurisdiction over the work relative to handling, transporting, use and storage of explosives. Blasting shall be done only by competent, and experienced men whose activities shall be conducted in a workmanlike manner. Satisfactory information must be provided to the Engineer, that the blaster meets or exceeds the qualifications enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 - Blaster Qualifications.

The Contractor shall protect all structures from the effects of the blast and repair any resulting damage. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the Engineer may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

1. Overburden: Undisturbed overburden may be deemed adequate in lieu of matting but only after the actual depth of the undisturbed overburden has been determined and adjudged sufficient by the Engineer. Under no circumstances will loose or fill overburden be adequate without the use of weighted mats.
2. Permission to Blast: The Contractor shall not be allowed to blast before 9 a.m. or after 3 p.m. without approval of the Engineer and Owner. Blasting will not occur within any rights-of-way maintained by any agency (D.O.T., R.R., Gas, Owner, etc.) without specific approval of the controlling agency and only in accordance with their respective requirements (as exceeded herein). The Contractor shall be held responsible for any and all injury to persons or damage to public or private property.
3. The Contractor shall not use excavated rock as backfill material. Dispose of rock which is surplus or not suitable for use as rip rap.
4. Monitoring: The Contractor shall notify the Engineer prior to any blasting. Additionally, the Contractor shall notify the Engineer before any charge is set. Following review by the Engineer regarding the proximity of permanent structures to the blasting site, the Engineer may direct the

Contractor to employ an independent, qualified specialty sub-contractor, approved by the Engineer, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

### **3.04 TRENCH EXCAVATION AND BACKFILL**

#### **A. TRENCH EXCAVATION**

1. General: Perform all excavation of every description and of whatever substance encountered so that the pipe can be laid to the alignment and depth shown on the Drawings.
2. Brace and shore all trenches, where required, in accordance with the rules and regulations, promulgated by the Department of Labor, Occupation Safety and Health Administration, "Safety and Health Regulations for Construction".
3. Make all excavations by open cut unless otherwise specified or indicated on the Drawings.
4. Width of Trenches: Excavate trenches sufficiently wide to allow proper installation of pipe, fittings and other materials and not more than 18" clear of pipe on either side at any point. Do not widen trenches by scraping or loosening materials from the sides.
5. Trench Excavation in Earth: Earth excavation includes all excavation of whatever substance encountered. In locations where pipe is to be bedded in earth excavated trenches, fine grade the bottoms of such trenches to allow firm bearing for the bottom of the pipe on undisturbed earth. Where any part of the trench has been excavated below the grade of the pipe, fill the part excavated below such grade with pipe bedding material and compact at the Contractor's expense.
6. Trench Excavation in Fill: If pipe is to be laid in embankments or other recently filled material, first place the fill material to the finish grade or to a height of at least one foot above the top of the pipe, whichever is the lesser. Take particular care to ensure maximum consolidation of material under the pipe location. Excavate the pipe trench as though in undisturbed material.
7. Trench Bottom in Poor Soil: Excavate and remove unstable or unsuitable soil to a width and depth, as directed by the Engineer, and refill with a thoroughly compacted gravel bedding.

8. Bell Holes: Provide bell holes at each joint to permit the joint to be made properly and to provide a continuous bearing and support for the pipe.

**B. TRENCH BACKFILL**

1. General: Unless otherwise specified or indicated on the Drawings, use suitable material for backfill which was removed in the course of making the construction excavations. Do not use frozen material for the backfill and do not place backfill on frozen material. Remove previously frozen material before new backfill is placed. Start backfilling as soon as practicable after the pipes have been laid, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, and proceed until its completion.
2. With the exception mentioned below in this paragraph, do not backfill trenches at pipe joints until after that section of the pipeline has successfully passed any specified tests required. Should the Contractor wish to minimize the maintenance of lights, and barricades, and the obstruction of traffic, he may, at his own risk, backfill the entire trench as soon as practicable after installation of pipe, and the related structures have acquired a suitable degree of strength. He shall, however, be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.
3. Material: The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. Both are subject to the approval of the Engineer. Do not place stone or rock fragments larger than 4" in greatest dimension in the backfill. Do not drop large masses of backfill material into the trench in such a manner as to endanger the pipeline. Use a timber grillage to break the fall of material dropped from a height of more than 5 feet. Exclude pieces of bituminous pavement from the backfill unless their use is expressly permitted.
4. Zone Around Pipe: Place bedding material to the level shown on the Drawings and work material carefully around the pipe to ensure that all voids are filled, particularly in bell holes. For backfill up to a level of 2 feet over the top of the pipe, use only selected materials containing no rock, clods or organic materials. Place the backfill and compact thoroughly under the pipe haunches and up to the mid-line of the pipe in layers not exceeding 6" in depth. Place each layer and tamp carefully and uniformly so as to eliminate the possibility of lateral displacement. Place and compact the remainder of the zone around the pipe and to a height of one foot above the pipe in layers not exceeding 6" and compact to a maximum density of at least 100 % as determined by ASTM D0698.

5. Tamping: Deposit and spread backfill materials in uniform, parallel layers not exceeding 12" thick before compaction. Tamp each layer before the next layer is placed to obtain a thoroughly compacted mass. Furnish and use, if necessary, an adequate number of power driven tampers, each weighing at least 20 pounds for this purpose. Take care that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similarly powered equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling and compacting as furnished by the Contractor.
6. Wet the material by sprinkling, if necessary, to insure proper compaction by tamping (or rolling). Perform no compaction by tamping (or rolling) when the material is too wet either from rain or applied water to be compacted properly.
7. Trench Compaction: Compact backfill in pipe trenches that is under pavement to the maximum density of soil material compacted at optimum moisture content to 95% and with the last 2' being 98%. Compact backfill in pipe trenches that is not under pavement to the maximum density of soil material compacted at optimum moisture content to 95%.

### **3.05 STRUCTURE EXCAVATION AND BACKFILL**

#### **A. STRUCTURE EXCAVATION**

1. Structure Excavation shall be made at the locations shown on the plans and to the exact subgrade required. Bottom of excavations shall be level and in firm, solid material, with soft material or voids treated as specified. Excavated areas shall be kept free of water during the construction period. Where earth will stand, footing trenches may be cut to the exact size of the footings; otherwise, forms shall be used. Where necessary, sides of excavations shall be shored and sheathed, or cofferdams built, as required for protection of the work and personnel.
2. Wherever excavation for a foundation extends below the water table or where specifically indicated on the plans, washed stone shall be placed to a minimum thickness of 12 inches, unless otherwise shown or as directed by the Engineer, prior to placing the foundation. The washed stone shall be compacted to 90% of maximum as determined by the Standard Proctor test (ASTM D698).

3. If the specified depth for foundations proves insufficient to reach firm ground, the Engineer shall be notified for furnishing instructions and proceeding with the work.

**B. STRUCTURE BACKFILL**

1. Structure Backfill shall be done with material free from large clods, frozen earth, organic material or any foreign matter, and shall evenly and carefully be placed and tamped in horizontal layers. Compaction equipment specifically designed for these purposes must be present and operational at the job site and shall be utilized throughout to obtain uniform compaction. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698), with compaction requirements as follows:

<u>Percent of Maximum Density at Optimum Moisture</u>	<u>Location</u>
98	Top 24" of fill beneath pavement and structures.
95	24" or deeper beneath all roads and driveways, full depth under sidewalks and undercut backfill for structure excavation.

2. No backfill shall be placed against a structural wall until all connecting structural members are in place. It shall be the Contractor's responsibility to provide compaction to such a degree that subsidence after placing shall not be detrimental to the stability or appearance of the structure, adjacent ground, or paved areas. The Contractor shall provide adequate protection to all structures during backfilling and shall use every precaution to avoid damaging or defacing them in any way. Contractor shall be responsible for the protection of all structures from damage or flotation prior to backfill being placed.
3. Unless otherwise approved by the Engineer, liquid-retaining structures shall not be backfilled until tested for leakage.

**3.06 UNSTABLE SUBGRADE**

- A. Should unstable soil, organic soil, or soil types classified as fine-grained soils (silts and clays) by ASTM D-2487 be encountered in the bottom of pipe trenches or structure excavations, such soils shall be removed to a depth and width determined by the Engineer, properly disposed of and shall be backfilled with crushed stone conforming to the Department of Transportation Specifications, Size 57. Placement shall not exceed 12-inches loose and compacted to 90% of the dry density determined by the Standard Proctor test ASTM D698 (Concrete

may be substituted in place of #57 stone at the Contractor's option. A 24-hour cure must be given before proceeding with the work).

**3.07    COMPACTION**

A.     Compaction: Unless otherwise noted, each layer of fill and backfill and the top 12 inches of existing subgrade material in cuts shall be compacted by approved equipment as specified below. Maximum lift thickness shall be 8” of loose material prior to compaction efforts. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698).

Percent of Max. Dry Density at Optimum Moisture Content

Top 24 inches of fill under pavement or structures	98%
24” and deeper under roads and structures	95%
Fill and backfill in other areas	95%

Material too dry for proper compaction shall be moistened by suitable watering devices, turned and harrowed to distribute moisture, and then properly compacted. When material is too wet for proper compaction, operations shall cease until such material has sufficiently dried.

### **3.08    COMPACTION TESTING**

- A.    The Owner, or its authorized representatives, reserve the right to perform compaction tests on any or all portion(s) of backfill placed at no cost to the Contractor. However, in the event the compaction of this backfill is not in compliance with the specification, then the Contractor shall take corrective measures at no cost to the Owner to bring the backfill within the limits of the specifications. The Contractor shall then be responsible for reimbursing the Owner all costs associated with the performance of compaction test(s) in those sections of the backfill that failed the initial compaction test(s). Minimum testing shall be:
  - 1.    Every 300 lf/lift in paved areas for linear utilities in paved areas.
  - 2.    Every 500 lf/lift in non-paved areas.
  - 3.    Other areas, such as adjacent to structures, 1 test/40 cubic yards of material.
- B.    In the event that the soil compaction is not in compliance with these specifications, then the Contractor shall take corrective action, at no cost to the Owner, to compact the soils within the limits of the specifications. The Engineer shall be notified within 24 hours of any failing compaction tests. Any retesting of failed areas shall be performed only after corrective measures have been made by the Contractor to bring the compacted soils into compliance. All retesting shall be performed with the Engineer present.
- C.    Codes and Standards: Perform excavation work in compliance with all applicable requirements of governing authorities having jurisdiction
- D.    Testing and Inspection Services:
  - 1.    Owners Testing Laboratory: The Owner will engage a soil testing and inspection service for quality control testing during earthwork operations. Reference Section entitled “Testing Laboratory Services”
  - 2.    Contractors Testing Laboratory: The Contractor shall engage at his own expense a testing laboratory acceptable to the Architect / Engineer to perform quality control testing of all proposed soil materials. Reference Section entitled “Testing Laboratory Services”
- E.    Depth of Bearing Strata: It is to be understood that site soil conditions are variable across the site. Footing design dimensions and bearing elevations shown are minimums. The design of the footings is based on the assumed strata bearing capacity at the elevation shown on the drawings and as indicated in the General Notes. If the indicated depth of footing excavation is reached without developing the required strata bearing capacity the Owners Geotechnical Engineer on site will

immediately advise the Contractor on the required corrective action for each individual footing or mats. For foundations required to bear on rock, the contractor shall provide a 1.5 inch diameter probe hole for every 50 square feet of exposed bearing surface. The probe hole should extend 1.5 times the least footing dimension or 10 feet, whichever is less. Revisions will be paid for in accordance with the Contract condition relative to changes in the Work.

F. Survey work, Grades, and Elevations

1. Grades and Elevations: Finished Grades indicated by spot elevation and normal contour line elevations denote finished top surface elevations. Report conflicts, errors and inconsistencies in grades and elevations to Architect/Engineer for resolution. Do not proceed with the work in questionable areas until conflicts are resolved by the Architect/Engineer.
2. Survey Work: Lay out work to the lines and levels required before excavation. Record actual measurements of each footing and mat plan centerline location, bottom elevation, deviation from specified tolerances, and all other pertinent data as required.

**END OF SECTION**



**PART 1: GENERAL****1.01 SCOPE OF WORK**

The work covered by this section consists of the preparation, shaping, and compaction of that portion of the roadbed upon which base or pavement, including base and paving for shoulders, is to be placed.

**PART 2: NOT USED****PART 3: EXECUTION****3.01 CONSTRUCTION**

- A. The subgrade shall be shaped to the lines, grades, and typical sections shown on the plans. All unsuitable material, boulders, and all vegetative matter shall be removed and replaced with suitable material. Suitable material, when not available from the subgrade work, shall be taken from roadway excavation or borrow pits.
- B. Material excavated in preparing the subgrade shall be stored or stockpiled in such a manner as to not interfere with proper drainage or any of the subsequent operations of placing base or pavement.
- C. The top 24" of subgrade in paved areas shall be compacted at a moisture content required to produce 98% of maximum density. All other areas subgrade will be compacted to 95% of maximum density at the optimum moisture content. The Contractor shall dry or add moisture to the subgrade when required to provide a uniformly compacted and acceptable subgrade.

**3.02 QUALITY CONTROL**

- A. Refer to Section 31 23 00 "Excavating, Backfilling, and Compacting for Utilities" for testing scenarios.
- B. A tolerance of plus or minus 1/2" from the established grade will be permitted after the subgrade has been graded to a uniform surface.
- C. Ditches and drains shall be provided and maintained when required to satisfactorily drain the subgrade. Where previously approved subgrade is damaged by natural causes, by hauling equipment, or by other traffic, the Contractor shall restore the subgrade to the required lines, grades, and typical sections and to the required density at no cost to the Owner.

**END OF SECTION**

**1. DESCRIPTION:**

- 1.1 Erosion and sedimentation control shall be provided by the Contractor for all areas of the site denuded or otherwise disturbed during construction. The Contractor shall be responsible for all installation, materials, labor, and maintenance of erosion and sediment control devices, as well as removal of temporary erosion and sediment control devices shown on the plans or required to protect all downstream properties, natural waterways, streams, lakes, ponds, catch basins, drainage ditches, roads, gutters, natural buffer zones, and man-made structures.
- 1.2 Erosion and sediment control procedures and facilities shall conform to the "Erosion and Sediment Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission, Sections 1607 and 1610 of the "Standard Specifications for Roads and Structures" dated January 1, 2018, as published by the North Carolina Department of Transportation and to all applicable local codes or ordinances, whichever is more stringent.
- 1.3 Related Work: See the following sections for related work.
  1. 31 32 00 Site Stabilization

**2. MATERIALS:**

- 2.1 Washed stone to be used in temporary sediment basins shall be of strong, durable nature, resistant to weathering and shall be graded to conform to Standard Size Number 57 per Section 1008 of the "Standard Specifications for Road and Structures" dated January 1, 2018, as published by the North Carolina Department of Transportation.
- 2.2 Refer to other sections within these specifications as listed in Item 1.3 above for other material specification required in the installation of erosion and sediment control facilities.

3. INSTALLATION:

3.1 General Requirements:

- 3.1.1 The Contractor shall follow the erosion control construction sequence schedule as shown on the contract drawings, except that should circumstances dictate that extra precaution be taken to prohibit erosion and sedimentation on the project, the Contractor will, at his own expense, take preventative measures as needed.
- 3.1.2 The Contractor is required to maintain all erosion and sediment control facilities to insure proper performance throughout the construction phase and until such time all disturbed areas are permanently stabilized.
- 3.1.3 Upon completion of construction or successful permanent stabilization of all areas which were disturbed before or during construction operations or as indicated on the construction drawings, whichever occurs last, the Contractor shall remove all temporary erosion and sediment control devices and facilities from the project site. The Contractor shall retain these items for future use or properly dispose of these items offsite.
- 3.1.4 The Contractor shall provide temporary or permanent ground cover as called for on the construction plans.

**END OF SECTION**

**1. DESCRIPTION:**

- 1.1 The work covered by this Section consists of the furnishing, installing, maintaining, replacing as needed, and removing of temporary silt fence. The Contractor shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications. All materials and procedures shall conform to Section 1605 of the "Standard Specifications for Roads and Structures", dated January 1, 2018, published by the North Carolina Department of Transportation, Section 4.3.1 of the "Erosion and Sediment Control Planning and Design Manual", published by the North Carolina Sediment Control Commission and all local codes and ordinances, whichever is more stringent.

**2. MATERIALS:****2.1 General Requirements:**

- 2.1.1 Temporary silt fence shall be a water permeable filter type fence for the purposes of removing suspended particles from the water passing through it.

**2.2 Posts:**

- 2.2.1 Either wood posts or steel posts may be used. Wood posts shall be a minimum of 6 feet long, at least 3 inches in diameter, and straight enough to provide a fence without noticeable misalignment. Steel posts shall be at least 5 feet in length, approximately 1-3/8 inches wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches, and shall have a means of retaining wire and fabric in the desired position without displacement.

**2.3 Woven Wire Fence:**

- 2.3.1 Wire fence fabric shall be at least 32 inches high, and shall have at least 6 horizontal wires. Vertical wires shall be spaced 12 inches apart. The top and bottom wires shall be at least 10 gage. All other wires shall be at least 12-1/2 gage.

**2.4 Silt Fence Filter Fabric:**

- 2.4.1 Filter fabric shall meet the requirements of Type 3 Engineering Fabric, Class A or B, per Section 1056 of the "Standard Specifications for Roads and Structures" dated January 1, 1990, published by the North Carolina Department of Transportation. Silt fence which incorporates filter fabric meeting the requirements of Section 1056 but which fails to

perform in an acceptable manner shall be replaced with silt fence which is capable of

acceptable performance. Silt fence should also meet the requirements of the "NCDENR Erosion Control Planning and Design Manual", latest revision.

2.5 Wire Staples:

2.5.1 Wire staples shall be a No. 9 staple and shall be at least 1½ inches long.

3. Installation:

3.1 General Requirements:

3.1.1 The Contractor shall install temporary silt fence as shown on the plans. The silt fence shall be constructed at the locations shown on the plans and at all other locations necessary to prevent sediment transport, as directed by the Engineer.

3.1.2 Class A synthetic filter fabric may be used only in conjunction with woven wire fence fabric backing. Filter fabric shall be attached to the wire fence fabric by wire or other acceptable means.

3.1.3 Class B synthetic filter fabric may be used without the woven wire fence fabric backing, subject to the following conditions:

3.1.4 Post spacing is reduced to a maximum of 6 feet.

3.1.5 The proposed fabric has been approved by the Engineer as being suitable for use without the woven wire fence fabric backing.

3.1.6 Fence posts shall be inclined toward the runoff source at an angle of not more than 20° from vertical.

3.1.7 Posts shall be installed so that no more than 3 feet of the post shall protrude above the ground. Where possible, the filter fabric from a continuous roll cut to the length of the barrier shall be used to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with overlap to the next post. At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

3.2 Maintenance and Removal:

3.2.1 The Contractor shall inspect temporary silt fences at least once a week and after each rainfall and shall make any required repairs and remove and dispose of silt accumulation immediately. Should the fabric of the silt fence collapse, tear, decompose or become ineffective, the Contractor will replace it promptly at his own expense.

The Contractor shall remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence.

- 3.2.2 The Contractor shall remove all temporary silt fence and associated appurtenances once all disturbed areas upland of the fence are properly and satisfactorily stabilized as called for on the plans.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. This section covers the furnishing of all labor, equipment and materials necessary for the establishment of vegetation of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses and legumes.

**PART 2: PRODUCTS****2.01 MATERIALS**

A. FERTILIZER

1. The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.
2. Fertilizer shall be 10-10-10 grade. Upon written approval of the Engineer a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.
3. During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

B. LIME

1. The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.
2. During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original conditions before being used.
3. Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and

shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

C. SEED

1. The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture. Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Engineer before being sown, and no seed will be accepted with a date of test more than 9 months prior to the date of sowing. Such testing however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.
2. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents or other causes.
3. Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.

D. MULCH

Straw Mulch shall be threshed straw of oats, rye or wheat free from matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.

E. TACKIFIER

Emulsified asphalt or organic tackifier such as Reclamare R2400 shall be sprayed uniformly on mulch as it is ejected from blower or immediately thereafter. Tackifier shall be applied evenly over area creating uniform appearance. Rates of



application will vary with conditions. Asphalt shall not be used in freezing weather.

## **PART 3: EXECUTION**

### **3.01 PREPARATION**

#### **A. PROTECTION OF EXISTING TREES AND VEGETATION**

1. Protect existing trees and other vegetation indicated to remain in place against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide wood or metal stakes set on 8 to 10 foot centers and connected at a 4'-0" height by 2" minimum brightly colored flagging tape to protect trees and vegetation to remain. Set perimeter of protection at the drip line of trees to remain unless approved otherwise by the Engineer.
2. Provide protection for roots over 1-1/2" diameter cut during construction operations. Cleanly cut off end of damaged root and coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.
3. The Contractor shall not remove or damage trees and shrubs which are outside the Clearing Limits established by the Owner or those within the Clearing Limits designated to remain.
4. Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Engineer. Repair damaged trees promptly to prevent progressive deterioration caused by damage.
5. Replace trees scheduled to remain and damaged beyond repair by construction operations, as determined by the Engineer with trees of similar size and species. Repair and replacement of trees scheduled to remain and damaged by construction operations or lack of adequate protection during construction operations shall be at the Contractor's expense.

#### **B. GRADING**

1. Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to

bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.

2. Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction material. It shall also include thorough loosening of the soil to a depth of 6" by plowing, discing, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of establishing vegetation shall be performed on a section by section basis immediately upon completion of earthwork or pipeline installation.
3. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Engineer may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Engineer.

#### C. SEEDBED PREPARATION

1. The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Engineer to provide for more effective seeding and for ease of subsequent mowing operations.
2. The soil shall then be scarified or otherwise loosened to a depth of not less than 6" except as otherwise provided below or otherwise directed by the Engineer. Clods shall be broken and the top 2" to 3" of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Engineer.
3. On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Engineer.
4. On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Engineer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.

5. On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.
6. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.

### **3.02 APPLICATION**

- A. Seed shall be applied by means of a hydro-seeder or other approved methods. The rates of application of seed, fertilizer and limestone shall be as stated in Table I.
- B. Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.
- C. Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.
- D. Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specified rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed. Seed shall be distributed uniformly over the seedbed at the required rate of application, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.
- E. When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.
- F. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.

- G. Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Engineer.
- H. When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

Such modifications may include but not be limited to the following:

- 1. The incorporation of limestone into the seedbed may be omitted on (a) cut slopes steeper than 2:1; (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.
- 2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.
- 3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

#### I. MULCHING

- 1. All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Engineer.
- 2. It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.
- 3. Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3" in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil. Mulch shall be applied within 24 hours after the completion of seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operation.
- 4. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.
- 5. Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in

place. The rate and method of application of binding material shall meet the approval of the Engineer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch application.

6. The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

### **3.03 MAINTENANCE**

- A. The Contractor shall keep all seeded areas in good condition, reseeding if and when necessary, until an acceptable stand of grass is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract. Any of these additional efforts will be at no additional cost to the Owner.
- B. Grassed areas will be accepted when a 95% cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.
- C. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.

#### **TABLE I - APPLICATION RATES**

##### **A. LIME AND FERTILIZER**

In the absence of a soil test, the following rates of application of limestone and fertilizer shall be:

1. 4,000 pounds limestone per acre
2. 1000 pounds 10-10-10 (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O) fertilizer per acre and the remaining quantity applied when vegetation is three inches in height or 45 days after seeding, whichever comes first.

##### **B. MULCH**

Mulch shall be applied at the following rates per acre:

1. 3,000-4,000 pounds straw mulch, or
2. 1,500-2,000 pounds wood cellulose fiber.
3. 35-40 cubic yards of shredded or hammermilled hardwood bark
4. 1,200-1,400 pounds of fiberglass roving

C. TEMPORARY SEED

The kinds of seed and the rates of application shall be as contained in this table. All rates are in pounds per acre. See Notes 1 and 2.

1. Fall and Winter (Normally August 1 to June 1)  
80 pounds of Ky-31 tall fescue and 15 pounds of rye grain
2. Summer (Normally May 1 to September 1)  
100 pounds of Ky-31 tall fescue

**NOTES**

1. On cut and fill slopes having 2:1 or steeper slopes, add 40 pounds of sericea lespedeza per acre to the planned seeding (hulled in spring and summer unhulled in fall and winter) plus 15 pounds of sudangrass in summer seeding or 25 pounds of rye cereal per acre in fall and winter seeding, if seeded September to February.
2. These seeding rates are prescribed for all sites with less than 50% ground cover and for sites with more than 50% ground cover where complete seeding is necessary to establish effective erosion control vegetative cover. On sites having 50% to 80% ground cover where complete seeding is not necessary to establish vegetative cover, reduce the seeding rate at least one-half the normal rate.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. The work covered by this section consists of the construction of plain rip rap in accordance with the requirements of the plans and these specifications and at the locations designated by the Engineer.

**PART 2: PRODUCTS****2.01 DEFINITIONS**

- A. PLAIN RIP RAP

Plain rip rap shall consist of quarry run stone, or field stone or granite stone, etc., and shall be classified by size into Class 1, or Class 2. The class and thickness to be used will be called for on the plans.

- B. CLASS 1 RIP RAP

Stone shall vary in weight from 5 to 200 pounds. At least 30% of the total weight of the rip rap shall be in individual pieces weighing a minimum of 60 pounds each. Not more than 10% of the total weight of the rip rap may be in individual pieces weighing less than 15 pounds each.

- C. CLASS 2 RIP RAP

Stone shall vary in weight from 25 to 250 pounds. At least 60% of the total weight shall be in individual pieces weighing a minimum of 100 pounds each and not more than 100 pounds each and not more than 5% of the total weight may be individual pieces weighing less than 50 pounds each.

**PART 3: EXECUTION****3.01 PLACEMENT OF RIP RAP**

- A. Unless otherwise indicated or directed by the Engineer, the stone shall be placed upon a slope which shall be no steeper than the angle of repose. The stone shall be graded so that the smaller stones are uniformly distributed throughout the mass. The area and thickness shall be as shown on the plans or as designated by the Engineer.

- B. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary; provided that when the rip rap is completed it forms a properly graded, dense, neat layer of stone.

**END OF SECTION**



**DIVISION 32**

**EXTERIOR IMPROVEMENTS**



**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. This section covers the furnishing of all labor, equipment and materials necessary for the proper restoration of existing surfaces disturbed or damaged as a result of construction operations which are not specifically scheduled or specified for topsoil and seeding, paving, landscaping or other surfacing.
- B. In general, the types of replacement included in this section are seeding along pipelines, concrete sidewalks, driveways, roadways, ditches, lawns and landscaped areas, curb and gutter.
- C. Any damage to existing structures shall be repaired using materials and workmanship equal to those of original construction.

**PART 2: NOT USED****PART 3: EXECUTION****3.01 RESTORATION OF SURFACES**

- A. SEEDING ALONG PIPELINES
  - 1. All ground surfaces along pipelines, which are not classified as lawns, landscaped areas, or pavement areas, but would be classified as open fields, shall be raked smooth and seeded in accordance with the section entitled Site Stabilization. Large rocks, clumps of earth and excessive spoil material shall be removed from the area prior to seeding.
  - 2. Shoulders of all roads shall be restored as specific for lawns and landscaped areas.
  - 3. Wooded areas, not classified as lawns shall be restored to as near their original condition as possible.
- B. CONCRETE SIDEWALKS
  - 1. Concrete walks removed in connection with, or damaged as a result of, construction operations under the Contract shall be replaced with new construction. Such walks shall be constructed of Class B concrete on a thoroughly compacted subgrade, shall have a vertical thickness of not less than 4" or the thickness of the replaced walk where greater than 4".

2. Walks shall be float finished, edged with an edging tool, and grooved at intermediate intervals not in excess of the width of the walk, uniform throughout the length of the walk in any one direction.

C. DRIVEWAYS

1. Unpaved driveways shall be surfaced with not less than 3" of Crusher-run gravel, topped with 3" of stone, gravel, or other materials equal to that found in the original driveway. Driveways shall be left in a condition better than their original condition.
2. Concrete drives shall be replaced with Class B concrete and shall have equal thickness and reinforcing steel to that of the original drive. Prior to placing the concrete, a 6" aggregate base course shall be placed in the drive area.
3. Bituminous or Asphaltic concrete drives shall be restored with a 6" aggregate base course and a 2" surface course, as defined in the section entitled Asphalt Pavement Repairs.

D. ROADWAY REPLACEMENT

1. Bituminous or Asphaltic pavements shall include all areas paved with blacktop; built-up pavements or oil and stone, tar and stone and similar pavements constructed with a bituminous or asphalt and stone materials.
2. Immediately upon completion of installation of underground piping and structures, the trench shall be backfilled and the roadway shall be repaired. In the excavated area, the repair shall consist of an 8" aggregate base course, 4" HB Binder Course and a 2" surface course as defined in the section entitled Bituminous Pavement Repairs. If, in the opinion of the Engineer, the area adjacent to the excavation has not been damaged to the extent that the base course need to be replaced, restoration may consist of a surface course of sufficient thickness to meet the existing pavement.
3. Portland cement concrete roadways shall be replaced with Class B Concrete and shall have equal thickness and reinforcing steel as the original roadway. An aggregate of 6" shall be placed prior to the placing of concrete.
4. Differential settlement of restored pavements shall be corrected immediately.
5. The Contractor shall repair and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications.

6. All existing manhole and valve covers shall be raised as required by the Contractor prior to paving. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

E. DITCHES

Ditches shall be regraded to the original grade and line. The surface of all ditches shall be returned to the same condition as found before commencing work.

F. LAWNS AND LANDSCAPED AREAS

1. Lawns and landscaped areas shall be regraded and replaced as follows:
  - a. Grading shall be to the grade existing before construction of the work under this Contract.
  - b. Lawn replacement shall be in accordance with the section entitled Landscaping. Topsoiled areas shall be replaced with topsoil of equal quality and quantity.
2. Landscaped areas shall be replaced with shrubs, hedges, ornamental trees, flowers, or other items to original condition.

G. CURB AND GUTTER

Curb and gutter removed with, or damaged as a result of construction operations, injured or disturbed by the Contractor, his agents, or employees, shall be replaced with new construction to a condition similar and equal to that existing before damage was incurred. Class B Concrete shall be used in curb and gutter replacement.

H. DAMAGE TO STRUCTURES

Any damage to existing structures shall be repaired of materials and workmanship equal to those of original construction. Extensively damaged structures, where the structural stability has been affected or which cannot be repaired in a suitable fashion shall be replaced entirely. Replacement shall not commence until approval of the plan of replacement has been given by the Engineer. Replacement costs shall be responsibility of the Contractor.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

This section covers the repairs of pavement for all asphalt surfaces.

**1.02 PERFORMANCE**

Construction of the subgrade, base course and paving shall be undertaken immediately after completion of all underground piping and structures, all curbs and gutters, all yard piping, conduits and other facilities passing beneath paved areas, and all structural slabs and foundations required within or adjacent to the paved areas.

**1.03 REFERENCES**

All work and materials required under this section of the specifications shall conform to the applicable sections of the North Carolina Department of Transportation, Division of Highways, Standard Specifications for Roads and Structures - Latest Edition.

**PART 2: NOT USED****PART 3: EXECUTION****3.01 INSTALLATION****A. PREPARATION OF SUBGRADE**

The work covered under this section of this specification shall be performed in strict accordance with Section 500 or Section 505 whichever is applicable, of the Standard Specifications for Road and Structures - Latest Edition, of the North Carolina Department of Transportation, Division of Highways.

**B. APPLICATION OF AGGREGATE BASE COURSE**

The work covered under this section of this specification shall be performed in strict accordance with Section 520 of the Standard Specification for Road Structures - Latest Edition, of the North Carolina Department of Transportation, Division of Highways.

**C. ASPHALT PLANT MIX - GENERAL**

The work covered under this section of this specification shall be performed in strict accordance with Section 610 and Section 620 of the Standard Specifications

for Roads and Structures - Latest Edition, of the North Carolina Department of Transportation, Division of Highways.

D. TACK COAT

1. Materials used as a tack coat shall meet the requirements for the grades indicated below unless otherwise indicated in the contract. Any of the grades of tack coat material noted in this specification may be used:
  - Asphalt Binder, Grade PG 64-22
  - Emulsified Asphalt, Grade RS-1H, CRS-1H, CRS-1, HFMS-1, CRS-2
2. Do not dilute or mix the tack coat with water, solvents, or other materials prior to application.
3. When tack coat is required beneath an open-graded asphalt friction course, the asphalt grade and rate of application to be used will be specified on the job mix formula.
4. Surface Preparation
  - a. The surface to which the tack coat is to be applied shall be cleaned of dust, dirt, clay, and any other deleterious matter prior to placing the tack coat.
  - b. The Contractor shall remove grass, dirt and other materials from the edge of the existing pavement prior to the placement of tack coat.
5. Weather Limitations
  - a. Tack shall be applied only when the surface to be treated is sufficiently dry and the atmospheric temperature in the shade away from artificial heat is 35° F or above.
  - b. Tack coat shall not be applied when the weather is foggy or rainy.
6. Application Rates and Temperatures
  - a. Tack coat shall be uniformly applied at a rate from 0.04 to 0.08 gallons per square yard. The exact rate of application will be established by the Engineer and will be based on the volume of material at the actual application temperature. When tack coat is required beneath an open-graded asphalt friction course, an asphalt binder Grade PG 64-22 material shall be used. The exact rate of

application will be specified on the job mix formula and will be within the range of 0.06 to 0.08 gallons per square yard.

- b. The temperature of the material at the time of application shall be within the ranges shown in the table below:

Application Temperatures for Tack Coat

Asphalt Material	Temperature Range
Asphalt Binder, Grade PG 64-22	375 - 425°F
Emulsified Asphalt, Grade RS-1H, CRS-1, CRS-1H	90 - 150°F
Emulsified Asphalt, Grade HFMS-1	90 - 160°F
Emulsified Asphalt, Grade CRS-2	125 - 185°F

7. Application

- a. No more tack coat material shall be applied than can be covered with base, intermediate, or surface course during the following day's paving operations.
- b. Tack coat material shall be uniformly applied to the entire surface utilizing an adjustable spray bar. Areas of tack coat application should be uniformly and completely covered.
- c. Tack coat shall be applied only in the presence of and as directed by the Engineer. No base or surface mixture shall be deposited onto the tacked pavement until the tack coat has sufficiently cured.
- d. Contact surfaces of headers, curbs, gutters, manholes, vertical faces of old pavements, and all exposed transverse and longitudinal edges of each course shall be painted or sprayed with tack coat before new asphalt mixture is placed adjacent to such surfaces.
- e. Bridge floors, curbs and handrails of structures, and all other appurtenances shall be covered to prevent tack coat from being tracked or splattered on the structures or appurtenances.

8. Protection

- a. Protect the tack coat after application until it has cured for a sufficient length of time to prevent it from being picked up by traffic.
- b. Contractor shall take the necessary precautions to minimize tracking and/or accumulation of tack coat material on existing or newly constructed pavements. Corrective measures may be required in areas where an excessive accumulation of tack has occurred.

E. BASE COURSE (B 25.0X); INTERMEDIATE COURSE (I 19.0X); SURFACE COURSES (S 12.5X, S AND SF 9.5X)

1. Weather and Temperature Limitations

- a. Asphalt mixtures shall not be produced or placed during rainy weather, when the subgrade or base course is frozen, or when the moisture on the surface to be paved would prevent proper bond. Asphalt material shall not be placed when the air temperature, measured in the shade away from artificial heat at the location of the paving operations, is less than the temperatures noted in the table on the following page.
- b. Where the surface course is to be placed on the intermediate course, the surface course shall be placed as soon as possible after the intermediate course has been placed, and in all cases during the same paving season.

Minimum Paving Temperatures

Asphalt Mixture	Minimum Air Temperature (°F)	Minimum Road Surface Temperature (°F)
B 25.0B B 25.0C	35	35
I 19.0B I 19.0C	35	35
S 9.5C, S 9.5D, S 12.5C, S 12.5D	50	50
SF 9.5A S 9.5B	40	50



## 2. Spreading and Finishing

- a. Coat surface of manhole frames and inlet frames with oil to prevent bonding with asphalt pavement. Do not tack or prime coat these surfaces.
- b. Tack coat shall be applied to the existing pavement, when necessary, in accordance with the provisions of these specifications.
- c. The asphalt mixture shall be spread and struck off to the required grades, cross sections, and thicknesses.
- d. Should unevenness of texture, tearing, segregation, or shoving occur during the paving operation due to unsatisfactory methods or equipment, the Contractor shall immediately take such action as may be necessary to correct such unsatisfactory work. Excessively throwing back material will not be permitted.

## 3. Compaction

- a. Immediately after the asphalt mixture has been spread, struck off, shaped to the required width, depth, cross-section, and surface and edge irregularities adjusted, it shall be thoroughly and uniformly compacted. Compaction must be obtained in a manner that provides uniform density over the pavement and meets the required degree of compaction for the type of mixture being placed. Compaction rolling shall be complete before material temperature drops below 185°F.
- b. Compaction rolling should be performed at the maximum temperature at which the mix will support the rollers without moving horizontally. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Adjustments to the compaction equipment may be required where uniform density is not being obtained throughout the depth of the layer being tested.
- c. All final wearing surfaces, except open-graded asphalt friction course, shall be compacted using a minimum of 2 steel wheel tandem rollers. Pneumatic-tired rollers with smooth tread tires may be used after the breakdown roller and prior to finish rolling. Vibratory rollers must not be operated in vibratory mode during finish rolling on any mix type or pavement layer.

- d. Rollers used to compact the mixture shall be in good condition and capable of reversing without backlash. The rollers shall be operated with the drive wheels nearest the paver and at uniform speeds slow enough to avoid displacement of the mixture. Steel wheel rollers shall be equipped with wetting devices to prevent the mixture from sticking to the roller wheels. Fuel oil shall not be used to moisten roller wheels.
- e. All asphalt mixtures, except open-graded asphalt friction course and type SF 9.5A, shall be compacted to at least 92 percent of the mixtures maximum specific gravity. An SF 9.5A mixture shall be compacted to at least 90 percent of the mixtures maximum specific gravity.
- f. Rolling for open-graded asphalt friction course shall consist of one coverage with a tandem steel wheel roller weighing a maximum of 10 tons, with additional rolling limited to one coverage with the roller where necessary to improve riding surface.
- g. The use of rolling equipment that results in excessive crushing of the aggregate or excessive displacement of the mixture will not be permitted.
- h. In areas inaccessible to standard rolling equipment, the mixture shall be thoroughly compacted by the use of hand tampers, hand operated mechanical tampers, or other approved equipment.
- i. The tolerance of the final compacted pavement shall be within 1/4" of the typical cross-sections shown on the plans.

#### 4. Joints

- a. Placement of surface course material as the final layer of pavement should not be placed between November 15 and April 1 of the next year unless otherwise approved by the Engineer. In addition, open-graded asphalt friction course shall not be placed between October 31 and April 1, unless otherwise approved.
- b. As an exception to the above, when in any day's operations the placement of a layer of asphalt base course material or intermediate course material 2 inches or greater in thickness has started, it may continue until the temperature drops to 32° F.

F.     TRAFFIC MARKINGS

The Contractor shall repair and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

G.     EXISTING UTILITIES

All existing manhole and valve covers shall be raised by the Contractor as necessary prior to paving so that the tops of the covers are flush with the final surface. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

**3.02   TESTING**

All of the above work will be subject to thickness and compaction tests as deemed necessary by the Engineer. Such tests will be at the Expense of the Owner.

**END OF SECTION**

## **SECTION 32 05 23 MISCELLANEOUS CONCRETE CONSTRUCTION**

### **PART 1: GENERAL**

#### **1.01 SCOPE OF WORK**

- A. This section covers concrete construction, complete, including reinforcement therefore.

### **PART 2: PRODUCTS**

#### **2.01 MATERIALS**

##### **A. REINFORCING**

Bar reinforcement shall be intermediate grade new billet steel conforming to the requirements of ASTM A-615. Unless otherwise noted, all reinforcing bars shall be grade 60. Wire fabric reinforcement shall consist of steel wire conforming to the requirements of ASTM A-185, latest revision.

##### **B. CONCRETE**

All concrete shall be equivalent to ready mix concrete manufactured and delivered in accordance with the requirements of ASTM C-94, latest revision and having a compressive strength at 28 days of 4000 psi, except as noted herein. The concrete manufacturer shall assume the responsibility of the design of the concrete mix in accordance with Alternate No. 2 of ASTM C-94. Air entrained concrete shall be used for all concrete exposed to the elements.

- a. Cement shall be Type 1 or Type 1A "Portland" cement conforming to ASTM C-150, latest revision or ASTM C-175, latest revision respectively.
- b. Aggregates shall conform to ASTM C-33, latest revision. Coarse aggregate shall be crushed rock or gravel and graded from 3/4" to #4 sieve for walls and slabs and from 2" to #4 sieve for mass or foundation concrete. Fine aggregate shall be natural sand.
- c. Mixing water shall be proportioned so that slump when measured with standard slump cone does not exceed the following:
  - i. Slabs in grade.....Max. 4", Min. 3"
  - ii. Footings.....Max. 5", Min. 3"
  - iii. All others.....Max. 6", Min. 3"
- d. Premolded joint filler strips shall be resilient compressive, bituminous and fiber material saturated, with at least 35% and not over 50% by weight of

asphalt. Poured type joint composition for expansion joints shall be elastic compound made up of asphalt and colloidal mineral fillers.

### **PART 3: EXECUTION**

#### **3.01 FORMS**

- A. Forms shall be wood, metal, structural hardboard or other suitable material that will produce the required surface finish. Forms placed for successive pours for continuous surfaces shall be fitted to accurate alignment to assure a smooth completed surface free from irregularities, and shall be sufficiently tight to prevent the loss of mortar. No forms shall be left permanently in place without approval of the Engineer. Holes resulting from removal of form ties shall be filled solid within 12 hours after removal of forms with cement mortar.

#### **3.02 PLACEMENT**

- A. Concrete shall be placed as nearly as possible in its final position. Runways for wheeled equipment shall not be supported on the reinforcement. Concrete shall be placed and compacted in layers not over 18 inches deep. Vibrators may be used provided they are used under experienced supervision and the mixture is dry enough to prevent segregation. Form vibrators shall not be used. Vibration shall not be used for transporting or moving concrete inside the forms. No more concrete shall be placed than can be consolidated and finished the same day as placed. Free fall of concrete shall be limited so that no segregation of materials occurs.

#### **3.03 JOINTS**

- A. Construction of joints not indicated on drawing shall be approved by the Engineer in advance of pour. Joints in foundation walls shall be keyed. Before depositing of concrete is resumed, the hardened surface shall be roughened, cleaned and wetted surfaces shall be slushed with a coating of neat cement grout against which the new concrete shall be placed before the new grout has attained its set.

#### **3.03 FINISHING**

- A. After stripping forms, all voids and honeycombs shall be patched by chipping and scarifying the defective area and treating it with an approved bonding tended that all such voids be patched, not merely plastered. Grout mixture shall consist of one part Portland cement and one-part sand. Immediately following removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or waterproofed.
- B. Slabs shall be struck off and consolidated by approved machine or hand methods, so that upon completion, the surface shall be true to grade as shown on drawings

and free of surface voids. All floors shall have monolithic steel trowel finish unless otherwise indicated on the drawings. Exterior walks shall be compacted, screeded and floated to a true even surface with wood floats and then broomed.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

The work covered by this section consists of the construction of a base composed of an approved aggregate material hauled to the site, placed on the site, compacted, and shaped to conform to the lines, grades, depths, and typical sections shown on the plans or established by the Engineer.

**PART 2: PRODUCTS****2.01 MATERIALS**

- A. Aggregate base course materials shall consist of crushed stone or uncrushed gravel, or other similar material having hard, strong, durable particles free of adherent coatings.
- C. The Contractor shall furnish aggregate base course material produced in accordance with the requirements indicated herein for Type A, aggregate unless otherwise specified in the special provisions.
- D. All aggregates shall be from approved sources. Sources will not be approved unless the material has satisfactory soundness and satisfactory resistance to abrasion. Satisfactory soundness will be considered to be a weighted average loss of not greater than 15% when subjected to five (5) alternations of the sodium sulfate soundness test in accordance with AASHTO T104. Satisfactory resistance to abrasion will be considered to be a percentage of wear of not greater than 55% when tested in accordance with AASHTO T96.
- E. Aggregates shall be handled in such a manner as to minimize segregation.
- F. Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground surface shall be firm, smooth, and well drained. A cover of at least 3" of aggregate shall be maintained over the ground surface in order to avoid the inclusion of soil or foreign material. Stockpiles shall be built in such a manner as to minimize segregation. When it is necessary to operate trucks or other equipment on a stockpile in the process of building the stockpile, it shall be done in a manner approved by the Engineer.
- G. Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or else separated by suitable walls or partitions, to prevent the mixing of the aggregates.

- H. Any method of stockpiling aggregates which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has been operated, and failure of such samples to meet all grading requirements for the aggregate will be considered cause for discontinuance of such stockpiling procedure.

- I. GRADATION

All standard sizes of aggregates shall meet the gradation requirements when tested in accordance with AASHTO T27.

## **PART 3: EXECUTION**

### **3.01 CONSTRUCTION OF STONE BASE**

- A. The aggregate material shall be spread on the subgrade to a uniform loose depth and without segregation.
- B. Where the required compacted thickness of base is 8" or less the base material may be spread and compacted in one layer. Where the required compacted thickness of base is more than 8", the base material shall be spread and compacted in 2 or more approximately equal layers. The minimum compacted thickness of any one layer shall be approximately 4".
- C. Each layer of material shall have been sampled, tested, compacted, and approved prior to placing succeeding layers of base material or pavement.
- D. No base material shall be placed on frozen subgrade or base. Hauling equipment shall not be operated on subgrade or a previously completed layer of base material soft enough to rut or weave beneath the equipment.
- E. The maximum speed of trucks hauling or traveling over any part of the subgrade or base shall be 5 miles per hour.
- F. The Contractor shall utilize methods of handling, hauling, and placing which will minimize segregation and contamination. If segregation occurs, the Engineer may require that changes be made in the Contractor's methods to minimize segregation, and may also require mixing on the road which may be necessary to correct any segregated material. No additional compensation will be allowed for the work of road mixing as may be required under this provision. Aggregate which is contaminated with foreign materials to the extent the base course will not adequately serve its intended use shall be removed and replaced by the Contractor



at no additional cost to the Owner. The above requirements will be applicable regardless of the type of aggregate placed and regardless of prior acceptance.

- G. The Engineer or the owner's representative will have the right to require that any portion of the work done in his presence and if the work is covered up after such instruction, is shall be exposed by the contractor for observation at no additional cost to the owner.

### **3.02 QUALITY CONTROL**

#### **A. TOLERANCES**

1. After final shaping and compacting the base, the Engineer will check the surface of the base for conformance to grade and typical section and will determine the base thickness.
2. The thickness of the base shall be within a tolerance of  $\pm 1/2''$  of the base thickness required by the plans.

#### **B. MAINTENANCE**

Where the base material is placed in a trench section, the Contractor shall provide adequate drainage through the shoulders to protect the subgrade and base until such time as shoulders are completed. The Contractor shall maintain the surface of the base by watering, machining, and rolling or dragging when necessary to prevent damage to the base by weather or traffic.

#### **C. TESTING**

1. There will be at least one base density test performed per 5,000 square feet. Compaction will be 100% of the maximum laboratory dry density as determined by ASTM D 1557 or AASHTO T 180. This test procedure will be the Owners responsibility to have done and at the owner's cost.
2. Depth measurements for compacted thickness shall be made by test holes through the base course. Where the base course is deficient, correct such areas by scarifying, adding base material and recompacting as directed by the Engineer. At staggered intervals not to exceed 250 feet for two lane streets and roads.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

The work covered by this section shall consist of the production, delivery, and placement of asphalt plant mix base, intermediate, and surface courses properly laid on a prepared aggregate base course, in accordance with these specifications and in conformity with the lines, grades, thickness, and typical sections shown on the plans.

**1.02 SUBMITTALS**

- A. Prior to paving operations, the contractor should supply the engineer with the appropriate job mix formulas (JMF) for review and approval.
- B. The quantity of asphalt materials, measured as provided in Section 31 12 16, will be paid for at the contract prices as specified in the bidding documents. In all cases, the Contractor shall furnish copies of certified weight tickets for all asphalt materials placed on the project.

**1.03 QUALITY ASSURANCE**

- A. The Owner's Representative or Engineer will have the right to require that any portion of the work be performed in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to the Owner. However, if the Owner's Representative or Engineer fails to appear within 48 hours, the Contractor may proceed without him.
- B. All work done and materials furnished shall be subject to review by the Owner, Engineer or Project Representative. Improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

The Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

- C. When required by the Engineer, the automatic weighing and recording system shall be checked by weighing a truck load of mix with an approved set of platform scales. Other means of checking the automatic weighing and recording system will be designated by the Engineer if such checking becomes necessary.

- D. The Contractor will not be permitted to use an asphalt mixture delivered to the road which is not accompanied by a load ticket signed by the weighman or an automatic printout ticket in accordance with the above requirements.
- E. The original of all tickets, including any voided tickets or tickets for rejected mixture, shall become the property of the Engineer.
- F. Asphalt materials will be accepted at the source of shipment subject to the following conditions:
  - 1. All asphalt transport tankers shall have a sampling valve in accordance with the requirements outlined by the Asphalt Institute and ASTM D140, or a comparable device acceptable to the Engineer.
  - 2. Each transport tanker delivering asphalt materials to the project shall keep a running log showing the date, destination, type and grade of material hauled on each trip. The tanker number shall be printed, stamped, or written in ink on each logbook. The logbook shall be available for examination upon request of the Engineer at any time.
  - 3. The Contractor shall furnish with each shipment two (2) copies of the delivery ticket. One copy shall accompany the shipment and be delivered to the Engineer or his representative at the destination. The delivery ticket shall contain the following information: Delivery ticket number, date shipped, state project or purchase order number, destination, name of consignee, trailer number, storage tank or batch number, quantity loaded (tons or gallons), loading temperature, specific gravity or pounds per gallon at 60°F, and net gallons at 60°F.
  - 4. The Engineer reserves the right to sample and test any shipment regardless of whether or not the above conditions have been met and to reject any material not meeting the requirements of the specifications.

#### **1.04 STORAGE AND DELIVERY**

##### **A. ASPHALT MIXTURE STORAGE SYSTEM**

- 1. The asphalt mixture storage system shall be capable of conveying the mix from the plant to the storage bin while minimizing production interruptions and ensuring the mixture discharged from the storage bin meets the job mix formula requirements.
- 2. The mixture shall be stored without a loss in temperature, segregation, or oxidation of the mix. Storage time should be limited to the ability of the storage system to maintain the mixture within the specification requirements.

## B. TRANSPORTATION OF ASPHALT MIXTURE

1. The mixture shall be transported from the mixing plant to the point of use in vehicles which have tight, clean, smooth metal beds that have been lightly coated with a release agent to prevent the mixture from adhering to the bed. The release agent should be a material that is approved by the North Carolina Department of Transportation (NCDOT) Materials and Test Unit. Each vehicle shall be equipped with a canvas or other suitable material that will cover the bed of the vehicle. All covers shall be constructed and secured as to prevent the entrance of moisture and the rapid loss of temperature. A 3/8" diameter hole shall be provided on each side of the vehicle body near the center of the body and 6" above the bed of the vehicle for the purpose of inserting a thermometer.
2. The temperature of the mixture immediately prior to discharge from the hauling vehicle shall be within a tolerance of plus 15°F to minus 25°F of the specified job mix temperature. The asphalt mixture temperature should not exceed 350°F. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250° F.

## PART 2: PRODUCTS

### 2.01 MATERIALS

#### A. COMPOSITION OF MIXTURES

1. Asphalt mixtures noted herein refers to mix types for base (B 25.0X), intermediate (I 19.0X), and surface (S 12.5X, S and SF 9.5X) courses.
2. The asphalt plant mix shall be composed of a mixture of course and fine aggregate, asphalt binder, and mineral filler. The aggregate components shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the grading and physical requirements of the NCDOT specifications for the specified mix type. Materials which will not produce an asphalt mixture within the full allowable tolerances required by these specifications will be rejected.
3. If a recycled mixture is used, reclaimed asphalt pavement (RAP) may constitute up to 50 percent of the total material used.
4. Asphalt mixtures should be designed and produced in accordance with the gradation and design criteria for the specified mix type outlined in Table 610-1 and Table 610-2 of the most current NCDOT Standard Specifications for Roads and Structures.

5. The job mix formula shall be established with the allowable tolerances within the design limits specified for the particular type of asphalt mixture. At a minimum, each job mix formula should include the following information:
  - Asphalt mixture type
  - Asphalt mixture identification number (JMF#)
  - Source and percentage of each aggregate and recycled asphalt pavement (RAP) component to be used.
  - JMF combined gradation including target value for percent passing each standard sieve.
  - Percentage of asphalt binder in RAP.
  - Supplier and percentage of anti-strip additive.
  - Supplier, grade, and percentage of asphalt binder.
  - Target value (percentage) of asphalt binder content by weight of total mix and required design properties at that percentage.
  - Mix temperature.
  - Volumetric properties of compacted mixture.
  - Required Field Density.
6. The job mix formula for each mixture shall be in effect until modified in writing by the Engineer.
7. All mixtures furnished for the work shall conform to the job mix formula within the tolerance ranges specified for the particular mix.
8. Should a change in sources of aggregate, RAP, or asphalt binder materials be made, a new job mix formula will be required before the new mixture is produced.
9. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.
10. The asphalt binder for the mixtures shall be a performance graded binder meeting the requirements of AASHTO M320. The binder grade used in standard asphalt mixtures in North Carolina is Performance Grade 64-22 (PG 64-22). Depending on traffic conditions and other factors, other grades of asphalt binder may be used.

**B. ASPHALT MATERIALS**

1. Asphalt Tack Coat
  - a. Materials used as a tack coat shall meet the requirements for the grades indicated below unless otherwise indicated in the contract.

Any of the grades of tack coat material noted in this specification may be used:

- Asphalt Binder, Grade PG 64-22
  - Emulsified Asphalt, Grade RS-1H, CRS-1H, CRS-1, HFMS-1, CRS-2
- b. Do not dilute or mix the tack coat with water, solvents, or other materials prior to application.
- c. When tack coat is required beneath an open-graded asphalt friction course, the asphalt grade and rate of application to be used will be specified on the job mix formula.

### **PART 3: EXECUTION**

#### **3.01 CONSTRUCTION REQUIREMENTS**

- A. BASE COURSE (B 25.0X); INTERMEDIATE COURSE (I 19.0X); SURFACE COURSES (S 12.5X, S AND SF 9.5X)
1. Weather and Temperature Limitations:
- a. Asphalt mixtures shall not be produced or placed during rainy weather, when the subgrade or base course is frozen, or when the moisture on the surface to be paved would prevent proper bond. Asphalt material shall not be placed when the air temperature, measured in the shade away from artificial heat at the location of the paving operations, is less than the temperatures noted in the table on the following page.
- b. Where the surface course is to be placed on the intermediate course, the surface course shall be placed as soon as possible after the intermediate course has been placed, and in all cases during the same paving season.

### Minimum Paving Temperatures

Asphalt Mixture	Minimum Air Temperature (°F)	Minimum Road Surface Temperature (°F)
B 25.0B B 25.0C	35	35
I 19.0B I 19.0C	35	35
S 9.5C, S 9.5D, S 12.5C, S 12.5D	50	50
SF 9.5A S 9.5B	40	50

#### 2. Spreading and Finishing:

- a. Coat surface of manhole frames and inlet frames with oil to prevent bonding with asphalt pavement. Do not tack or prime coat these surfaces.
- b. Tack coat shall be applied to the existing pavement, when necessary, in accordance with the provisions of these specifications.
- c. The asphalt mixture shall be spread and struck off to the required grades, cross sections, and thicknesses by self contained, power propelled pavers. The pavers shall be equipped with an activated screed plate assembly which is designed to be preheated. The screed unit shall be equipped with a sliding shoe attachment that will form a slope on the edge of the mixture to help prevent edge raveling when the mixture is compacted. The paver shall be equipped with a receiving hopper and an automatically controlled distribution system capable of maintaining a uniform load of material in front of the full length of the screed.
- d. A string line shall be placed by the Contractor for the first lane of each layer of mixture placed to provide alignment control for the paver, except when the first layer is placed adjacent to a curb section.
- e. Pavers shall be operated at forward speeds consistent with plant production, mixture delivery and satisfactory laying of the mixture in order to provide a uniform and continuous laydown operation. Paving and loading operations should be coordinated such that an adequate amount of asphalt mixture is maintained in the paver hopper between trucks. Do not allow the hopper to become empty

between loads. Should unevenness of texture, tearing, segregation, or shoving occur during the paving operation due to unsatisfactory methods or equipment, the Contractor shall immediately take such action as may be necessary to correct such unsatisfactory work. Excessively throwing back material will not be permitted.

- f. Pavers shall be equipped with an electronic screed which will automatically control the longitudinal profile and cross slope of the pavement by the use of either a mobile grade reference(s), or string line(s), joint matching shoes, or other approved methods. When a fixed string line is required, the Engineer will furnish grade stakes for the finished pavement grade and the Contractor shall furnish and erect the necessary guide line for the equipment.
- g. A mobile grade reference system or non-contacting laser or sonar type ski shall be used during placement of the initial lanes and all adjacent lanes of all layers to control the longitudinal profile. A joint matching device may only be used where approved by the Engineer.
- h. An automatic slope control system shall be utilized, unless otherwise approved. The Engineer may waive the requirement for automatic slope controls in areas where the use of such equipment is impractical due to irregular cross section or shape. Mobile grade references may be required when the use of automatic slope controls is waived. Manual screed operation will be permitted based on approval from the Engineer for construction of irregularly shaped and minor areas.
- i. In the case of malfunction of the automatic control equipment, the Contractor may manually operate the paver for the remainder of the workday only provided acceptable results are obtained.
- j. The Engineer will waive the requirement for use of pavers for spreading and finishing where irregularities or obstacles make their use impractical and the Contractor shall spread, rake, and lute the mixture by hand methods.
- k. Roadway paving shall be as continuous as possible. Intersections, auxiliary lanes, and irregular areas shall be paved after the adjacent roadway has been paved.

3. Compaction:

- a. Immediately after the asphalt mixture has been spread, struck off, shaped to the required width, depth, cross-section, and surface and edge irregularities adjusted, it shall be thoroughly and uniformly



compacted. Compaction must be obtained in a manner that provides uniform density over the pavement and meets the required degree of compaction for the type of mixture being placed. Compaction rolling shall be complete before material temperature drops below 185°F.

- b. Compaction rolling should be performed at the maximum temperature at which the mix will support the rollers without moving horizontally. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Adjustments to the compaction equipment may be required where uniform density is not being obtained throughout the depth of the layer being tested.
- c. All final wearing surfaces, except open-graded asphalt friction course, shall be compacted using a minimum of 2 steel wheel tandem rollers. Pneumatic-tired rollers with smooth tread tires may be used after the breakdown roller and prior to finish rolling. Vibratory rollers must not be operated in vibratory mode during finish rolling on any mix type or pavement layer.
- d. Rollers used to compact the mixture shall be in good condition and capable of reversing without backlash. The rollers shall be operated with the drive wheels nearest the paver and at uniform speeds slow enough to avoid displacement of the mixture. Steel wheel rollers shall be equipped with wetting devices to prevent the mixture from sticking to the roller wheels. Fuel oil shall not be used to moisten roller wheels.
- e. All asphalt mixtures, except open-graded asphalt friction course and type SF 9.5A, shall be compacted to at least 92 percent of the mixtures maximum specific gravity. An SF 9.5A mixture shall be compacted to at least 90 percent of the mixtures maximum specific gravity.
- f. Rolling for open-graded asphalt friction course shall consist of one coverage with a tandem steel wheel roller weighing a maximum of 10 tons, with additional rolling limited to one coverage with the roller where necessary to improve riding surface.
- g. The use of rolling equipment that results in excessive crushing of the aggregate or excessive displacement of the mixture will not be permitted.
- h. In areas inaccessible to standard rolling equipment, the mixture shall be thoroughly compacted by the use of hand tampers, hand operated mechanical tampers, or other approved equipment.

- i. The tolerance of the final compacted pavement shall be within 1/4" of the typical cross-sections shown on the plans.

4. Joints:

a. Transverse Joints-

- i. Transverse joints shall be constructed when the laying of the mixture is to be suspended long enough to permit the mixture to become cooled. At the end of each day's paving operation, the Contractor shall construct a sloped wedge ahead of the end of the full depth pavement to provide for proper compaction and protection of the full depth pavement. The Contractor shall place a paper parting strip beneath this wedge to facilitate joint construction, unless otherwise waived by the Engineers.
- ii. Before paving operations are resumed, the Contractor shall remove the sloped wedge and cut back into the previously constructed pavement to the point of full pavement depth. The exposed edge of the previously constructed pavement shall then be lightly coated with tack coat.
- iii. When laying of the mixture is resumed at the joint, the construction of the joint shall be completed while the mixture is still in a workable condition.

b. Longitudinal Joints-

- i. The exposed edge of all longitudinal joints should be lightly coated with tack coat prior to placing the adjoining pavement.
- ii. Longitudinal joints shall be formed by allowing the paver to deposit the mixture adjacent to the joint to such depth that maximum compaction can be obtained along the joint. The joint shall be pinched by rolling immediately behind the paver.
- iii. When multi-lane multi-layer construction is required, the longitudinal joint in each layer shall offset that in the layer immediately below by approximately 6 inches. The joint in the top layer shall be constructed, where possible, between design travel lanes.

- c. Placement of surface course material as the final layer of pavement should not be placed between November 15 and April 1 of the next year unless otherwise approved by the Engineer. In addition, open-graded asphalt friction course shall not be placed between October 31 and April 1, unless otherwise approved.
- d. As an exception to the above, when in any day's operations the placement of a layer of asphalt base course material or intermediate course material 2 inches or greater in thickness has started, it may continue until the temperature drops to 32° F.

**B. ASPHALT TACK COAT**

**1. Surface Preparation:**

- a. The surface to which the tack coat is to be applied shall be cleaned of dust, dirt, clay, and any other deleterious matter prior to placing the tack coat.
- b. The Contractor shall remove grass, dirt and other materials from the edge of the existing pavement prior to the placement of tack coat.

**2. Weather Limitations:**

- a. Tack shall be applied only when the surface to be treated is sufficiently dry and the atmospheric temperature in the shade away from artificial heat is 35° F or above.
- b. Tack coat shall not be applied when the weather is foggy or rainy.

**3. Application Rates and Temperatures:**

- a. Tack coat shall be uniformly applied at a rate from 0.04 to 0.08 gallons per square yard. The exact rate of application will be established by the Engineer and will be based on the volume of material at the actual application temperature. When tack coat is required beneath an open-graded asphalt friction course, an asphalt binder Grade PG 64-22 material shall be used. The exact rate of application will be specified on the job mix formula and will be within the range of 0.06 to 0.08 gallons per square yard.
- b. The temperature of the material at the time of application shall be within the ranges shown in the table below:

Application Temperatures for Tack Coat

Asphalt Material	Temperature Range
Asphalt Binder, Grade PG 64-22	375 - 425°F
Emulsified Asphalt, Grade RS-1H, CRS-1, CRS-1H	90 - 150°F
Emulsified Asphalt, Grade HFMS-1	90 - 160°F
Emulsified Asphalt, Grade CRS-2	125 - 185°F

4. Application:

- a. No more tack coat material shall be applied than can be covered with base, intermediate, or surface course during the following day's paving operations.
- b. Tack coat material shall be uniformly applied to the entire surface utilizing an adjustable spray bar. Areas of tack coat application should be uniformly and completely covered.
- c. Tack coat shall be applied only in the presence of and as directed by the Engineer. No base or surface mixture shall be deposited onto tacked the tacked pavement until the tack coat has sufficiently cured.
- d. Contact surfaces of headers, curbs, gutters, manholes, vertical faces of old pavements, and all exposed transverse and longitudinal edges of each course shall be painted or sprayed with tack coat before new asphalt mixture is placed adjacent to such surfaces.
- e. Bridge floors, curbs and handrails of structures, and all other appurtenances shall be covered to prevent tack coat from being tracked or splattered on the structures or appurtenances.

5. Protection:

- a. Protect the tack coat after application until it has cured for a sufficient length of time to prevent it from being picked up by traffic.

- b. Contractor shall take the necessary precautions to minimize tracking and/or accumulation of tack coat material on existing or newly constructed pavements. Corrective measures may be required in areas where an excessive accumulation of tack has occurred.

### **3.02 QUALITY CONTROL AND TESTING**

#### **A. SAMPLES AND TESTING**

1. It will be the responsibility of the Owner to hire and pay for an independent testing agency to perform quality control testing during paving operations.
2. Density testing to verify compaction may be performed by either Nuclear density procedures or Core Sampling procedures, and will be designated by the Engineer.
3. Nuclear density testing shall be performed the same day the mix being tested is placed and compacted. Nuclear density tests must be performed at a frequency of no less than 1 test every 400 linear feet for each mix type and layer, with a minimum of 5 nuclear density readings on a given day's paving.
4. Core samples shall be 6 inches in diameter and obtained no later than the beginning of the next production day, not to exceed 3 calendar days. Core samples shall be tested and test results submitted to the Engineer within one working day from the time the cores are taken. Cores must be obtained at a minimum frequency of 1 core every 1000 linear feet for each mix type and layer, with a minimum of 3 cores obtained on a given day's paving.
5. Cores shall be obtained from the full layer depth of compacted pavement at random locations. Artificial methods may be utilized to cool the pavement layers to allow cutting the core samples as quickly as possible.
6. Where cores have been taken, clean the inside surfaces of the core hole, dry, apply tack coat, place and compact the same type asphalt mixture to conform with the surrounding area.
7. It will be the responsibility of the Contractor to perform sufficient testing at the plant to verify mix production is in accordance with the specified job mix formulas being used.
8. During mix production, samples of the asphalt mixture should be obtained at a minimum frequency of 1 sample every 750 tons produced, with a minimum of 1 sample for each day's production for each asphalt mixture

produced. Each sample should be tested to determine binder content, gradation, and maximum specific gravity. As requested by the Engineer, additional tests may be performed to verify the volumetric properties of the asphalt mixture being produced. The Engineer may also request that the independent testing agency oversee the testing, or perform testing on additional samples.

**B. SURFACE REQUIREMENTS**

1. The surface of the plant mix base or pavement after compaction shall be smooth and true to the required cross section and grade. Any defective areas shall be corrected with satisfactory material which shall be immediately compacted to conform with the surrounding area. Any area showing an excess of asphalt cement shall be removed and replaced.
2. The surface will be tested by the Engineer at all joints and at other selected locations using a 10'-0" straightedge. The variation of the surface from the testing edge of the straightedge, when applied parallel to the centerline of the surface, shall not exceed 1/8" between any two contact points. Areas found to exceed this tolerance shall be corrected by the Contractor by removal of the defective work and replacement with new material unless other corrective measures are permitted by the Engineer. The work and materials required in the correction of defective work shall be provided by the Contractor at no cost.
3. The Contractor shall repaint and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.
4. All existing manhole, inlet, and valve covers shall be raised by the Contractor as necessary prior to paving so that the tops of the covers are flush with the final surface. Any pavement left on covers shall be removed as necessary by the contractor. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

The work covered by this section consists of the construction of Portland cement concrete curb/curb and gutter, in accordance with the requirements shown on the plans and the provisions of the specifications.

**1.02 QUALITY ASSURANCE**

Concrete curb/curb and gutter shall meet the requirements of Section 846-3 of the NCDOT Standard Specifications for Roads and Structures (latest edition). The requirements for horizontal and vertical alignment as indicated in the applicable sections of the Specifications shall be strictly adhered to.

**PART 2: PRODUCTS****2.01 MATERIALS**

- A. Concrete shall be constructed in accordance with Section 03 30 00, except as otherwise provided herein. 4,000-PSI concrete shall be used. Prior to placing forms, the base or subgrade shall have been compacted to the degree required by the applicable section of these specifications. Concrete shall be air entrained with 5 to 7% air. Retarders and accelerators shall be used only as directed by the engineer.
- B. Concrete curb/curb and gutter shall meet the requirements of Section 846-3 of the NCDOT Standard Specifications for Roads and Structures (latest edition). The requirements for horizontal and vertical alignment as indicated in the applicable sections of the Specifications shall be strictly adhered to.

**PART 3: EXECUTION****3.01 INSTALLATION****A. FORMS**

Forms shall be of such section and design that they will adequately support the concrete and any construction equipment used to construct the work. Straight forms shall be within a tolerance of 1/8" in 10'-0" from a true line horizontally and vertically. Form pins shall be metal and shall be capable of holding the forms rigidly in place during construction operations. The form sections shall be connected by a locking joint, which shall keep the forms free from vertical and horizontal movement. The Engineer shall have approved all forms before

concrete is placed. Forms shall be clean, straight and true. The Engineer has the right to reject forms not properly placed, aligned or cleaned.

- B. When the concrete will be machine placed the surface over which the machine will be operated will have been approved by the Engineer before placing concrete.

- C. FINISHING

The concrete shall be given a light broom finish with the brush marks parallel to the curb line or gutter line.

- D. CURBING

Curing shall be in accordance with Article 825-9 and Subarticle 700-14(b) of the above referenced NCDOT Specifications. Curing compounds shall be Type 2, white pigmented, in accordance with AASHTO M148 and applied in accordance with Article 420-17(c).

- E. JOINTS

1. Joints shall be located as shown on the details except as otherwise provided herein. Where concrete is placed adjacent to Portland cement concrete pavement, the joints shall be located so as to line up with the joints in the concrete pavement.
2. Grooved contraction joints shall be formed by the use of templates or by other approved methods. Where templates do not form such joints, the groove shall be of the depth shown on the details.
3. Grooved butt joints shall be placed between the work and adjacent pavement except where expansion joints are required by the details.
4. All joints shall be hot pour sealed with rubber asphalt joint sealer meeting the requirements of AASHTO M173 except for joints in curb sections. In curb and gutter the joint sealer shall not be poured above the top surface of the gutter. Joints in gutter shall be filled with joint sealer to the top surface of the gutter. Joints shall be sealed before backfilling or other adjacent operations are performed. Joint sealer shall be in accordance with Article 928-2 of the above referenced NCDOT Specifications.

- F. BACKFILLING

No earth backfill or pavement shall be placed adjacent to the curb and gutter until at least three curing days have elapsed. Backfill shall be compacted to a degree satisfactory to the Engineer.



G. OPENING TO TRAFFIC

Vehicles may be permitted on the completed work after seven curing days have elapsed. When high early strength concrete is used, vehicles will be permitted on the completed work after three curing days have elapsed.

**3.02 QUALITY CONTROL & TESTING**

- A. All sampling and testing services shall be performed, at the Owners expense, by a testing agency which operates in accordance to ASTM D 3740 and E 329 latest edition and accepted by the Engineer.
- B. The Contractor shall submit for review a design mix for each class of concrete proposed for use. An approved testing laboratory shall prepare the mix. Compressive strength of at least four (4) specimens of the design mix shall indicate 15% higher than 28-day strengths specified. During the work, the Contractor shall make 3 test cylinders for each 30 cubic yards, or fraction thereof, of concrete placed each day. One cylinder shall be tested at 7 days and the other two at 28 days in accordance with ASTM C 39. Copies of all test reports shall be furnished to the Engineer.
- C. A slump test is to be performed at the same time the cylinders are pulled for each 30cy of concrete placed each day. Slump is to be 4" with a tolerance of +/- 1". Anything out of this range is to be approved by the engineer prior to placement

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. The work covered by this section consists of the construction of Portland cement concrete sidewalks in accordance with the requirements shown on the plans and the provisions of these specifications.

**PART 2: PRODUCTS****2.01 MATERIALS**

- A. Concrete shall be constructed in accordance with Section 03 30 00 and shall be given a sidewalk finish, except as otherwise provided herein. 4000 psi concrete shall be used.

**PART 3: EXECUTION****3.01 INSTALLATION**

- A. Brooming of the concrete surface shall be done transverse to the direction of traffic. Joint spacing shall not be less than 5'-0". Where existing sidewalks are being widened, transverse joints shall be located so as to line up with existing joints in the adjacent sidewalk. Joints shall not be sealed.
- B. Backfill shall be compacted to a degree comparable to the adjacent undisturbed material.
- C. Vehicles may be permitted on the completed work after seven curing days have elapsed. When high early strength concrete is used, vehicles will be permitted on the completed work after three curing days have elapsed.

**3.02 QUALITY CONTROL & TESTING**

- A. All sampling and testing services shall be performed, at the Owners expense, by a testing agency which operates in accordance to ASTM D 3740 and E 329 latest edition and accepted by the Engineer. Refer to section 03 11 00 for procedures.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK****A. PAINT**

The work under this section shall consist of furnishing all labor, equipment, materials and services for the proper placement and installation of all pavement markings in accordance with the requirements shown on the plans and the provisions of these specifications.

**B. THERMOPLASTIC PAVING MARKING**

This specification covers a reflectorized pavement striping material of the type that is applied to a road surface in a molten state with premixed glass beads by spray or extrusion means, with a supplemental surface application of glass spheres. When applied properly and at the designated thickness and width the stripe shall, upon cooling, be reflectorized and be able to resist deformation by traffic. The applied material shall be impervious to degradation by motor oil, diesel fuel, grease deposits and ice-preventative chemicals.

**1.02 DELIVERY, STORAGE, AND HANDLING**

Contractor shall deliver paint to site in sealed and labeled containers. Upon Engineer's request, the Contractor shall make containers available for inspection to verify acceptance of product. Paint shall be stored at a minimum ambient temperature of 45°F and a maximum of 90°F, in well ventilated areas, unless required otherwise by manufacturer's instructions.

**1.03 RELATED DOCUMENTS**

All pavement markings shall be in accordance with the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration and the North Carolina Supplement to the MUTCD.

**PART 2: PRODUCTS****2.01 MATERIALS****A. STANDARDS**

The following are minimum requirements and shall govern except all local, state and/or federal highway or transportation department standard specifications shall govern when their requirements are in excess thereof.

B. PAINT

Paint shall be chlorinated rubber-alkyd type meeting the requirements of AASHTO M 248 (FS TT-P-115), Type III factory mixed, quick drying and non-bleeding.

C. THERMOPLASTIC MATERIALS

1. The thermoplastic pavement marking materials used in this contract shall meet the following specifications. This specification covers reflectorized oil and grease impervious thermoplastic road marking materials which are (1) hot extrusion applied with a surface application of glass spheres and (2) heat fused applied. The properly applied markings shall be reflectorized and able to durably resist degradation and deformation by traffic.
2. The thermoplastic materials shall be homogenously composed of pigment, filler, resins, and glass reflectorizing sphere and shall be available in both yellow and white.
3. Composition: The pigment, beads and filler shall be uniformly dispersed in the resin. The materials shall be free from all skins, dirt, and foreign objects and shall comply with requirements according to Table 1. Only new materials shall be acceptable for use on this project.

Table 1

COMPONENT	WHITE	YELLOW
Binder (see note A)	18.0% min	18.0% min
Glass Beads (AAASHTO M247 Type D)	30.0 - 40.0%	30.0 - 40.0%
Titanium Dioxide	10.0% min	----
Yellow Pigments	----	2.0% min
Calcium Carbonate	42.0% max	50.0% max

**Note A:** The alkyd binder shall consist of a mixture of synthetic resins (at least one of which is solid at room temperature) and a high boiling point plasticizer. At least one third of binder composition shall be solid maleic modified glycerol ester resin and shall be no less than 8% by weight of the entire material formulation. The alkyd binder shall not contain petroleum based hydrocarbon resins.

**Note B:** The percentage of yellow pigment can be reduced if lead pigments are eliminated from the formulation.

4. Specifications:

- a. Temperature- The molten material temperature shall be between 400 and 440 F unless otherwise recommended by the manufacturer and approved by the Engineer.
- b. Primer- A primer shall be used if thermoplastic is applied to Portland cement concrete. Any primer used shall be compatible with the thermoplastic material.
- c. Thickness- The pavement markings shall yield a solid thickness range of 80 to 95 mils above the roadway surface across the middle two-thirds of the line width when tested as specified in MSMT 729.
- d. Glass Beads- Glass beads shall be uniformly applied to the surface of the molten thermoplastic at the minimum rate of 7 to 9 lb./100ft<sup>2</sup> as specified in MSMT 729
- e. Color- The color of the dry markings shall match Federal Standard 595 (13538-yellow or 17886-white). The Contractor shall supply the specified color chips for the Engineer's use to visually determine that the thermoplastic material matches the specified color.
- f. Retro reflectance- The millicandela/lux/square meter values taken anytime within the first 30 days shall conform to the following:

Retroreflectance

COLOR	RETROREFLECTIVITY	CORRECTIVE ACTION
White	$\geq 250$	None
Yellow	$\geq 150$	
White	$< 250$	Necessary corrective actions including grinding and, if necessary, re-tracing
Yellow	$< 150$	

- g. The “Drop-On” glass beads shall conform to AASHTO specifications M-247-81 except as follows:

Glass Bead Gradation

US SIEVE NUMBER	PERCENT PASSING
20	100
30	75-95
50	15-35
80	0-5
100	0

The “Drop-On” glass beads shall be smooth, clear and free from air inclusions. The beads shall have a minimum refractive index of 1.50 and shall be a minimum of 80% true spheres overall and minimum 70% true spheres on each sieve. The beads shall be moisture proof coated and shall meet the requirements of AASHTO M-247-81 Section 4.4.2 to insure optimum embedment of 60-65 percent (60-65%) in various thermoplastic traffic marking systems. The material shall set to bear traffic in not more than 2 minutes when the air temperature is 50 degrees F and not more than 10 minutes when the air temperature is 90 degrees F.

- h. Bond Strength- After heating the thermoplastic material for four hours at 425 degrees F the bond strength to Portland Cement Concrete shall exceed 180 psi (1.24 Mpa Method ASTM D4796-88)
- i. Cracking Resistance- For at least 90 days after application the materials shall show no cracks other than with substrate cracking.
- j. Smear and Softening Resistance- During the life of the materials, the applied markings shall not smear or soften apart from substrate movement.

D. TRAFFIC AND LINE MARKINGS

1. Unless otherwise noted, paint for traffic and line markings shall be white in color.
2. Dimensions and spacing of markings shall be in accordance with MUTCD and as indicated in the pavement markings detail included in the contract drawings.

## **PART 3: EXECUTION**

### **3.01 SURFACE PREPARATION**

Contractor must insure that pavement surface to be painted shall be clean and dry before application. All surface contamination such as oil, grease, dirt, foreign matter, or other deleterious materials will be removed by the Contractor prior to application of paint.

### **3.02 INSTALLATION**

#### **A. PAINT**

1. No paint shall be applied when the atmospheric, surface, or material temperature is less than 40°F or when the relative humidity is greater than 85%.
2. No paint shall be applied until the layout and placement has been verified by the Engineer.
3. Paint shall be applied with mechanical equipment to produce uniform straight edges in strict compliance with the manufacturer's instructions. Paint shall be applied in two (2) coats at the manufacturer's recommended rates.

#### **B. THERMOPLASTIC PAVING MARKINGS**

1. The molten applied thermoplastic material shall readily screed/extrude at temperatures between 400 degrees F and 440 degrees F from the approved equipment to produce a line which shall be continuous and uniform in shape having sharp dimensions. The application of additional glass beads by drop-on methods shall be at a minimum rate of 8 lbs. per 100 sq ft of marking. Ambient and surface temperatures shall be at least 50 degrees F and rising at the time of application.

2. Method of Application

The Contractor shall furnish and install machine-applied extruded and/or sprayed hot thermoplastic with glass spheres (pre mixed and drop-on) in the proper ratio to immediately produce a highly reflective marking as described elsewhere in these specifications, in accordance with the details in this contract and the following provisions.

3. Primer-Sealer:

It shall be the responsibility of the contractor to recommend to the Engineer and obtain the Engineer's concurrence as to whether primer-

sealer is required on a given pavement in order to meet the material manufacturer's warranty conditions. Generally, on all Portland Cement concrete pavement surfaces and aged asphalt-concrete pavements having less than eighty percent (80%) bituminous concrete, primer-sealer shall be applied to the area where the thermoplastic pavement markings are to be placed. Also, the Owner reserves the right to direct the Contractor to apply primer/sealer for any given markings. The primer/sealer shall be that recommended by the manufacturer of the thermoplastic material, and approved by the Engineer. The material shall form a continuous film which shall dry rapidly and adhere to the pavement. The material shall not discolor nor cause any noticeable change in the appearance of the pavement outside of the finished pavement markings. All solvents shall have evaporated from the primer/sealer prior to the application of the molten thermoplastic materials. A sample of the primer/sealer and the recommended method of application must be submitted to the Engineer, and shall have been approved by the Engineer and the manufacturer of the material before application. The Engineer has the authority to require the Contractor to apply the primer/sealer using a separate vehicle which may require additional traffic control. Payment for application of primer/sealer and any additional traffic control will be incidental to the marking item.

4. Removal of Existing Plastic or Pavement Markings

When called for in the contract or otherwise as directed by the Engineer, removal of existing painted or plastic pavement markings shall be accomplished by the Contractor using equipment and methods specifically approved by the Engineer. Marking removal shall not be by the "painting out" with black paint method nor shall it result in excessive scarring of the pavement. No more than 1/8-inch depth of scarred pavement will be allowed. At least 90 percent of all markings shall be removed.

As directed by the Engineer, the Contractor shall be responsible for sweeping or otherwise adequately cleaning up debris after completion of markings required to be removed by the Engineer because they are improperly located or otherwise incorrect or improper. Unless permitted otherwise by the Engineer, where old markings are removed, the new markings must be applied the same day as the old markings are removed. Whenever grinding, scraping, sandblasting, or other operations are performed, the work shall be conducted in such manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect motorists. When these operations are completed, the pavement markings shall be cleaned to remove residue and debris resulting from the cleaning work.



Where cleaning and/or removal of pavement paint striping or objectionable material is being performed within ten (10) feet of a lane occupied by traffic, the residue removal shall be by method(s) approved by the Engineer.

Any damage to the pavement or pavement joint materials caused by pavement marking removal shall be repaired by the Contractor at no cost to the Owner by methods acceptable to the Engineer.

5. Pre-marking of Lines

When a line is required to be placed in the same location as an existing painted line, and existing painted markings not required to be removed are visible, they shall be retraced (i.e. new markings installed in exactly the same locations, patterns, and dimensions as the old markings). However, if the existing markings are to be removed or are not visible, or if new roadway surface has been placed before markings installation occurs, or if the contract requires a line to be installed where none currently exists, the Contractor will be required to pre-mark as directed by the Engineer and subsequently shall install the required markings in accordance with the requirement of other sections of the specifications. The actual placement of the pavement markings at any such site shall not be performed until the pre-marking has been inspected and approved by the Engineer. Pre-marking is incidental to the pavement marking installation work and there will be no separate payment for pre-marking.

6. Traffic Maintenance

All work shall be performed in accordance with Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) and section 104 of the MSHA Standard Specifications for Construction and Materials. The Contractor shall furnish and place all warning devices, flag persons, and other traffic control devices required to direct, control and protect the traveling public while marking operations are in progress. Maintenance of traffic for this work will be paid under the Maintenance of Traffic item if an item is included in the bid proposal, otherwise it will be considered incidental to the work.

### **3.02     WARRANTIES**

#### **A.     THERMOPLASTIC PAVING MARKINGS**

The Thermoplastic pavement marking materials and glass beads furnished under this contract shall assume the manufacturer's warranty for these materials and shall be guaranteed by the supplier against failure due to traffic oil degradation.

The contractor shall assume all costs arising from the use of patented materials, equipment, devices or processes used on or incorporated in the work, and agrees to indemnify and hold harmless the Owner and its duly authorized representatives from all suits at law or action of every nature for, or on account of, the use of any patented materials equipment, devices or processes. Further, the material shall meet the requirements of this specification for a period of one year.

**END OF SECTION**

**PART 1: GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section Includes:

- 1. Chain-link fences.

- B. Related Sections:

- 2. Section 03 30 00 “Cast-in-Place Concrete” for concrete post footings.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design chain-link fences and gates, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Chain-link fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCEISEI 7
  - 1. Minimum Post Size: Determine according to ASTM F 1043 for framework up to 12 feet (3.66 m) high, and post spacing not to exceed 10 feet (3 m) for steel.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences.
  - 1. Fence and gate posts, rails, and fittings.
  - 2. Chain-link fabric, reinforcements, and attachments.
- B. Samples for Initial Selection: For components with factory-applied color finishes.

C. Samples for Verification: Prepared 'on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

D. Delegated-Design Submittal: For chain-link fences and gate framework indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Qualification Data: For qualified factory-authorized service representative.

F. Product Certificates: For each type of chain-link fence, from manufacturer.

G. Product Test Reports: For framing strength according to ASTM F 1043.

H. Field quality-control reports.

I. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:

1. Polymer finishes.
2. Gate hardware.
3. Gate operator.

J. Warranty: Sample of special warranty.

## **1.5 QUALITY ASSURANCE**

## **1.6 PROJECT CONDITIONS**

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

## **PART 2: PRODUCTS**

### **2.1 CHAIN-LINK FENCE FABRIC**

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawing - C201.

2. Steel Wire Fabric: Wire with a diameter of 0.120 inch.
  - a. Mesh Size: 1 3/4" inches.
  - b. Polymer-Coated Fabric: ASTM F 668, Class 1 over zinc coated steel wire.
    - 1) Color: As selected by Architect from manufacturer's full range, complying with ASTM F 934.
  - c. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
3. Selvage: Knuckled at both selvages.

## **2.2 FENCE FRAMING**

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
  1. Fence Height: As indicated on Drawing
  2. Light Industrial Strength: Material Group IC-L, round steel pipe, electric-resistance welded pipe
    - a. Line Post: 2.375 inches (60 mm)
    - b. End, Comer and Pull Post: 2.375 inches (60 mm)
  3. Horizontal Framework Members: Intermediate, top, and, bottom rails complying with ASTM F 1043.
    - a. Top Rail: 1.66 inches (42 mm) in diameter
  4. Brace Rails: Comply with ASTM F 1043.
  5. Metallic Coating for Steel Framing:
    - a. Type A, consisting of not less than minimum 2.0-oz.lsq. ft. (0 .61-kg/sq. m) average zinc coating per ASTM A 123/A 123M or 4.0-oz.lsq. ft. (1.22-kg/sq. m) zinc coating per ASTM A 653/A 653M.
  6. Polymer coating over metallic coating.

- a. Color: As selected by Architect from manufacturer's full range, complying with ASTM F 934.

## **2.3     TENSION WIRE**

- A. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:
  - 1. Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
    - a. Matching chain-link fabric coating weight.

## **2.4     FITTINGS**

- A. General: Comply with ASTM F626.
- B. Post Caps: Provide for each post.
  - 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
  - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

- a. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

- 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. Isq. ft. (366 9 Isq. m) zinc.
  - a. Polymer coating over metallic coating.

## 2.5 **GROUT AND ANCHORING CEMENT**

- A. Nonshrink, Nonmetallic Grout Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydrauliccontrolled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.
  - 1. Connectors for Below-Grade Use: Exothermic welded type.
  - 2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches (16 by 2440 mm).

## 2.6 **BARBED WIRE**

- A. Metallic Coated Steel Barbed Wire: Comply with ASTM A121, Design Number 12-4-5-14R, double 12-½ gauge (0.099 in.) (2.51 mm) twisted strand wire, with 4 point 14 gauge (0.080 in.) (2.03 mm) round barbs spaced 5 inches (127 mm) on center. Match coating type to that of the chain link fabric. [12-4-5-14R is specifically designed for chain link fence applications] <Insert material coating specification including type and class when applicable>
  - 1. Coating Type A - Aluminum-Coated (Aluminized): Strand wire coating, 0.30 oz/ft² (90 g/m²) with aluminum alloy barbs.
  - 2. Coating Type Z - Zinc-coated: Strand wire coating Type Z, Class 3, 0.80 oz/ft² (254 g/m²), barb coating 0.70 oz/ft² (215g/m²)

## **PART 3: EXECUTION**

### **3.1 EXAMINATION**

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

### **3.3 INSTALLATION, GENERAL**

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

1. Install fencing on established boundary lines inside property line.

### **3.4 CHAIN-LINK FENCE INSTALLATION**

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
  - a. Concealed Concrete: Top 2 inches below grade to allow covering with surface material.
  - b. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been



inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

- c. Posts Set into Voids in Concrete: Form or core drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- D. Line Posts: Space line posts uniformly at 96 inches (2440 mm) o.c.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
  - 1. Locate horizontal braces at midheight of fabric 72 inches (1830 mm) or higher, on fences with top rail and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
  - 1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches (152 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- H. Intermediate and Bottom Rails: Install and secure to posts with fittings.

- I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch (25.4 mm) between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner; pull, and gate posts with tension bands spaced no more than 15 inches (380 mm) o.c.
- K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.
- L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

### **3.5 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain chain-link fences and gates.

### **END OF SECTION**

**PART 1: GENERAL****1.01 SECTION INCLUDES**

- A. Segmental retaining walls made of modular concrete units with soil reinforcement.
- B. Engineering design.

**1.02 PRICE AND PAYMENT PROCEDURES**

- A. Excavation of unsuitable soil and replacement with acceptable fill will be paid for at unit prices specified in **Section 01 30 00**.

**1.03 REFERENCE STANDARDS**

- A. AASHTO M 288 - Standard Specification for Geotextiles; 2006.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units; 2011.
- D. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils; 1963 (Reapproved 2007).
- E. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012.
- F. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil using standard effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012.
- G. ASTM D1241 - Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses; 2007.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- I. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

- J. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- K. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- L. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- M. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- N. ASTM D5321/D5321M - Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear; 2014.
- O. ASTM D6706 - Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil; 2001 (Reapproved 2013).
- P. NCMA TR-127 - Design Manual for Segmental Retaining Walls; 2010, Third Edition.

#### **1.04    SUBMITTALS**

##### **A.    Concrete Units:**

- 1.    Manufacturer's product data.
- 2.    Test data on unit strength and shear resistance between units.
- 3.    Test data on soil reinforcement connection.
- 4.    Manufacturer's certification that units meet requirements of specification.
- 5.    Storage and handling requirements and recommendations.
- 6.    Installation methods.

##### **B.    Soil Reinforcement:**

- 1.    Manufacturer's product data.

2. Manufacturer's certification that product meets requirements of specification.
  3. Preparation instructions and recommendations.
  4. Storage and handling requirements and recommendations.
  5. Installation methods.
- C. Shop Drawings: Engineering drawings for installation, including elevations, large-scale details of elevations, typical sections, details, and connections, soil reinforcement, and drainage provisions
1. Wall manufacturer and/or installer to create and submit plan and section drawings showing exact dimensions for blocks, required coping, and other minor revisions.
  2. Design Data: Submit detailed design calculations showing compliance with specified design criteria and material evaluations performed in accordance with specified design standard, signed and sealed by a Structural Engineer. Detailed design calculations will require review and approval by State Construction Office as a delegated design.
  3. Submit no less than 4 weeks prior to start of work.
  4. Obtain approval of Engineer prior to start of work.
- D. Unit Sample: One unit units typical of size, color, and finish texture specified.
- E. Soil Reinforcement to Unit Connector: One connector.
- F. Design Engineer's Qualification Statement.
- G. Concrete Unit Manufacturer Qualification Statement.

## **1.05 QUALITY ASSURANCE**

- A. Design Engineer Qualifications: Provide design by or under direct supervision of Professional Engineer experienced in the work of this section and licensed in the State in which the Project is located and:

1. Having minimum of five years documented experience in design of reinforced soil structures.
- B. Preconstruction Soil Testing: Engage a qualified independent testing agency to test soil reinforcement and backfill materials for compliance with design criteria.
- C. Reinforced Soil Evaluation and Testing / Special Inspections: Performed by qualified independent testing agency. See Special Inspections Schedule.
- D. Do not install any retaining wall blocks with visual damage, such as but not limited to, chips, cracks, or discoloration.

## **1.06 SPECIAL INSPECTIONS SCHEDULE**

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

- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Concrete Construction
- ☐ Masonry – Level 1<sup>a</sup>
- ☐ Wood Construction
- ☒ Soils
- ☐ Driven Deep Foundations
- ☐ Cast-in-Place Deep Foundations
- ☐ Sprayed Fire Resistant Material
- ☐ Intumescent Fire-Resistant Coatings
- ☐ Exterior Insulation & Finish Systems
- ☐ Smoke Control
- ☒ Retaining Walls Exceeding 5 Feet
- ☐ Wind-Resisting Components (1705.4)<sup>b</sup>
- ☐ Wind Requirements (1706)<sup>c</sup>
- ☐ Seismic Resistance<sup>d</sup>

☐ Helical Pile Foundations

- A. Occupancy Category IV structures, as defined by 1604.5 of the North Carolina Building Code, may require Level 2 inspection of masonry construction. The SER shall review Code sections 1704.5.1 and 1704.5.3 and adjust the Schedule of Special Inspection Services as needed.
- B. Special inspections for Wind Resistance are applicable to those areas defined by 1705.4 of the North Carolina Building Code. Wind Resistance Special Inspections are only effective if the 1704.1.2 base triggers apply.
- C. Special Inspections for Wind Requirements are applicable to those areas defined by 1706.1 of the North Carolina Building Code. Wind Requirements are effective even if the 1704.1.2 base triggers do not apply

INSPECTION AGENTS	QUALIFICATIONS	ADDRESS
1. Special Inspector	SI	
2. Structural Engineer of Record	SER	
3. Testing Laboratory	ITL	
4. Other		

- D. Special Inspections for Seismic Resistance are applicable to those structures defined by 1707.1 of the North Carolina Building Code. Seismic Requirements are only effective if the 1704.1.2 base triggers apply

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

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

Basic Wind Speed:                ☐ 90-109mph    ☒ 110-119mph    ☐ ≥120mph

Wind Exposure Category:    ☐ B        ☐ C        ☐ D

## SOILS

ITEM	QUALIFICATION	SCOPE
1. Site Preparation	SI	<ul style="list-style-type: none"><li>• Determine that the subgrade has been prepared in accordance with the approved soils report and the construction document</li></ul>
2. Fill Placement	SI	<ul style="list-style-type: none"><li>• Periodic classification and testing of compacted fill materials</li><li>• Continuous observation of materials used, densities, and lift thickness ensuring compliance with the approved soils report and the construction documents</li></ul>
3. Evaluation	SI / ITL	<ul style="list-style-type: none"><li>• Determine that the materials below shallow foundations are adequate to achieve the design bearing capacity</li></ul>

## RETAINING WALLS EXCEEING 5 FEET

ITEM	QUALIFICATIONS	SCOPE
1. Retaining Systems	SI / ITL / SER	<ul style="list-style-type: none"><li>• All retaining walls exceeding 5 feet in height require special inspections. Refer to the applicable material schedules for explicit requirements.</li></ul>
2. Application	SI	<ul style="list-style-type: none"><li>• Periodic examination of backfill materials for compliance with the approved specifications</li></ul>



		<ul style="list-style-type: none"> <li>• Confirm that all subsoil drainage piping is undamaged, drains freely to the designated outlet structure, and has been installed per the approved engineered design</li> </ul>
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## **1.07    MOCK-UP**

- A. Prior to erection of retaining walls, provide mock-up for evaluation of installation workmanship.
- B. Erect 4 by 4 ft sample wall using materials specified.
- C. Locate mock-up where directed by Architect.
- D. Do not start masonry work until mock-up has been approved by Engineer.
- E. Retain mock-up during construction as standard for judging completed work. Do not alter or destroy mock-up until work is completed.

## **PART 2: PRODUCTS**

### **2.01    MANUFACTURERS**

#### **A. Segmental Concrete Units:**

- 1. Redi-Rock; Ledgestone Series
- 2. Vertiblock; Gray
- 3. Recon Gravity Wall System; Northshore Granite

#### **B. Soil Reinforcement:**

- 1. To be specified by Design Engineer.

### **2.02    RETAINING WALLS**

- A. Contractor is responsible for design of segmental retaining walls as noted on the plans.
- B. Design Standard: Design retaining walls to be capable of withstanding the effects of gravity loads due to soil pressures resulting from grades indicated, determined in accordance with NCMA TR-127 Design Manual for Segmental Retaining Walls; perform all stability analyses specified in this standard.
  - 1. In addition, comply with applicable local, state, and federal codes and regulations.
  - 2. This design method considers potential failure modes categorized by external, internal, local, compound, and global stability.
  - 3. Provide engineering services as required for analysis for all modes of stability.
  - 4. Use of design software for calculations is permitted.
  - 5. Live load for parking areas shall be a minimum of 250 lb/sf
  - 6. Submit complete shop drawings showing all features of the design.
- B. Shear Resistance: Design the wall not to exceed the capacity of materials and soils to resist shear:
  - 1. Shear Resistance Between Units: Determine in accordance with NCMA SRWU-2
  - 2. Connection Between Units and Soil Reinforcement: Determine in accordance with NCMA SWRU-1.
  - 3. Coefficient for Direct Shear of Reinforcement on Soil: Determine in accordance with ASTM D5321/D5321M using soil similar in gradation and texture to that to be used for fill in the reinforced zone.

C. Soil Reinforcement:

1. Test reinforcement to be used in accordance with ASTM D6706 using soil taken from project site.
2. Do not use more than one type of reinforcement attached to units within the same wall; do not use products made by different manufacturers in the same wall; minimize the number of different reinforcement and filter products to avoid confusion in placement.
3. Walls Less Than 12 Feet (3.5 M) High: Use only one type of reinforcement of one grade and strength.
4. Length Back from Wall: Not less than dimensions shown on the drawings.
5. Long Term Design Strength of Reinforcement: Determine in accordance with NCMA TR-127:  $LTDS = Tult / (RFd + RFid + RFcr)$ , where:
  - a.  $Tult$  = Ultimate (tensile) strength,
  - b.  $RFd$  = Reduction Factor for chemical and biological durability; minimum 1.1 for polyethylene and polypropylene, 1.15 for coated polyester geogrids, and 1.6 for polyester geotextiles;
  - c.  $RFid$  = Reduction Factor for Installation Damage;
  - d.  $RFcr$  = Reduction Factor for Creep; consistent with test procedure used for determining the ultimate strength.

- E. Drainage: Design to prevent water accumulation in retained soil; use drainage fill and drainage pipe as required; provide outlets at 50 foot intervals along length of wall, minimum.

**2.03 MATERIALS**

- A. Retaining Wall Units: Machine-formed concrete blocks of shapes and sizes suitable for the retaining wall configuration required and complying with ASTM C1372 and the following:
1. Face Color: Natural cement gray.
  2. Texture: Split face, on exposed surfaces.
  3. Face Shape: Straight (flat).
  4. Moisture Absorption: 8 percent, maximum.
- B. Cap Units: Portland cement concrete machine-formed solid blocks, matching segmental concrete units, complying with ASTM C1372, with abutting edges saw cut or formed to provide tight fitting, flush end-to-end joints.
1. Height: 4 inches, minimum.
  2. Depth: To fully cover wall units.
  3. Masonry Adhesive: To secure cap units as top course of wall.
    - a. Expected Life Span: 30 years.
    - b. Provide adhesive conforming to ASTM C920, Type S, Grade NS, Class 25, and as approved by unit manufacturer.
- C. Shear Connectors: Connection method to withstand design stresses and prevent movement of segmental units, and to hold soil reinforcement in proper design position during grid pre-tensioning and backfilling.
1. Maintain strength over design temperature range of minus 10 degrees F to plus 100 degrees F.
- D. Soil Reinforcement: Polymeric geosynthetic specifically fabricated for use as soil reinforcement, dimensionally stable and able to retain geometry under manufacture, transport, and installation.

1. Polymeric Material: 100 percent virgin resin with maximum of 5 percent in-plant regrind material; polypropylene, polyethylene, or polyester.
  - a. Polyethylene and Polypropylene: Stabilized with long term antioxidants.
  - b. Polyester: Minimum molecular weight of 25,000 and carboxyl end group number less than 30.
2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491.
3. UV Resistance: 70 percent after 500 hours, when tested in accordance with ASTM D4355/D4355M.
4. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 oz/sq yard.

E. Drainage Filter: Geosynthetic textile.

1. Apparent Opening Size: 70 to 100 U.S. Sieve size, when tested in accordance with ASTM D4751.
2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491.
3. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 oz/sq yard.

F. Aggregate for Leveling Pad: Compacted sand, gravel, or crushed rock complying with one of the following:

1. Meeting requirements of ASTM D1241, Gradation C.
2. Do not use pea gravel.

G. Concrete for Leveling Pad: Unreinforced concrete with compressive strength of 3,000 psi

- H. Drainage Fill: Clean, freely draining aggregate placed within, between, or immediately behind segmental units; do not use pea gravel; use one of the following:
1. Aggregate as approved by Architect.
  2. Aggregate meeting requirements of ASTM D448, Size No. 57.
  3. Crushed stone or coarse gravel, 3/8 to; no more than 5 percent passing No. 200 sieve.
  4. Crushed stone or coarse gravel, meeting requirements of ASTM D422.
- I. Backfill: Compacted soil placed behind drainage fill; do not use heavy clay or organic soils; comply with one of the following:
1. Use site-excavated or other soil approved by Architect.
  2. Granular soil with less than 5 percent passing No. 200 sieve.
  3. Inorganic ASTM D2487 soil types GP, GW, SP, or SM, free of debris.
    - a. Maximum Size: 3/4 inch, unless approved by Design Engineer, and design strength reduced to account for additional installation damage.
    - b. Plasticity of Fines: Less than 10. Liquid Limit: Less than 40, when tested in accordance with ASTM D4318.
- J. Drainage Pipe: Perforated PVC, complying with ASTM D3034; or corrugated PE complying with ASTM F405; with geotextile filter wrap.

## **PART 3: EXECUTION**

### **3.01 PREPARATION**

#### **A. Excavation:**

1. Excavate to lines and grades indicated on drawings.
2. Do not disturb embankment or foundation beyond lines. Minimize over-excavation; fill over-excavated areas with compacted reinforced backfill or leveling pad material at Contractor's expense.
3. After excavation, and prior to placement of leveling materials, Geotechnical Engineer will examine bearing soil surface to verify strength meets or exceeds design requirements and assumptions.
4. Replace unsuitable bearing soil as directed by Geotechnical Engineer.

#### **B. Leveling Pad:**

1. Width: 6 inches minimum extension beyond front and back faces of units.
2. In lieu of pad made solely of aggregate or concrete, pad may be 3 inches, minimum, of thick compacted sand or crushed rock, covered with 2 inches to 3 inches of unreinforced concrete.
3. Location: Top of pad at 1 inch below grade for each 8 inches that wall extends above grade.
4. Compact aggregate to lines and grades on drawings, in lifts 6 inches thick, maximum.
5. Use only hand-operated compaction equipment within 36 inches of back of wall.

#### **C. Verify level grade before proceeding.**

- D. Install drainage collection pipe with a continuous fall in the direction of flow. Cap open ends as necessary to prevent soil and debris from entering.

### **3.02 INSTALLATION**

- A. Install in accordance with drawings, manufacturer instructions, and applicable codes and regulations.
- B. Segmental Concrete Units:
  - 1. Place first course of units on leveling pad; check alignment and level. Check for full contact with base and for stability.
  - 2. Place units side by side for full length of wall, aligning back face of straight walls using string line or offset from base line and back face of curved walls using flexible pipe or other method recommended by manufacturer
  - 3. Do not leave gaps between units.
  - 4. Lay out corners and curves in accordance with manufacturer's instructions. Do not leave gaps to produce wall batter or curvature.
  - 5. Cut blocks with saw; do not split units.
  - 6. Sweep excess material from tops of units before laying succeeding courses.
  - 7. Place succeeding courses. Check for proper alignment and batter.
  - 8. Where top of wall changes elevation, step units to match grade or turn top course into embankment.
  - 9. Where bottom of wall changes elevation, step base leveling pad and extend lowest course a minimum of two units into slope.



- C. Soil Reinforcement: Install each layer on fully compacted fill.
1. Orient soil reinforcement material with highest strength axis perpendicular to wall alignment.
  2. Attach to top of wall units and extend horizontally, full length, over compacted backfill.
  3. Install in one piece lengths with 100 percent coverage in each layer at each level. Do not splice or leave gaps between panels or ends of pieces.
- D. Drainage Fill: Place drainage fill in, between, and behind units.
1. Compact to lines and grades on drawings, in lifts 6 inches thick, maximum; decrease lift thickness where necessary to achieve required density.
  2. Extend drainage fill 6 inches beyond back face of units.
- E. Backfill: Place, spread, and compact backfill from behind drainage fill to undisturbed soil.
1. Use only lightweight hand-operated compaction equipment within 3 ft from back wall face, or one half of wall height, whichever is greater.
  2. Place backfill in lifts of maximum 6 inches to 8 inches loose thickness where hand compaction is used and 8 inches to 10 inches
  3. Compact backfill to 95 percent of maximum density, standard Proctor, as determined in accordance with ASTM D698, or as recommended by Geotechnical Engineer.
  4. Moisture content of backfill prior to and during compaction to be within plus 1 or minus 3 percentage points dry of optimum and uniform throughout each layer.

5. Do not operate tracked construction equipment directly upon soil reinforcement.
  6. At end of each day, slope top of backfill away from wall to direct runoff away from wall face. Prevent runoff from adjacent areas from entering wall site.
  7. At completion, if other work adjacent to wall is not to be done immediately (paving, landscaping, etc), grade top of backfill and provide temporary drainage to prevent water runoff toward the wall.
- F. Cap Units: Install and top two courses of units with masonry adhesive.
1. Clear cap units and top course of segmental concrete units of debris and standing water before applying adhesive.
  2. Apply masonry adhesive to top surface of top unit and place cap into position over projecting pins. Protect wall face from masonry adhesive.

### **3.03 TOLERANCES**

- A. Top of Wall:
1. Plan Location: Maximum of plus/minus 12 inch from plan location.
  2. Elevation: Maximum of plus/minus 6 inch from elevations shown on drawings.
- B. Face of Wall Flatness: Measured as deviation from a straight edge.
1. In the Vertical Dimension: Plus/minus 1-1/2 inch per 10 foot section.
  2. In the Horizontal Dimension of Straight Walls: Plus/minus 1-1/2 inch per 10 foot section.

- C. Overall Wall Batter: Within 2 degrees of design, measured from the vertical.
- D. Gap Between Adjacent Units: 1/8 inch, maximum.

### **3.04    PROTECTION**

- A. Prevent damage to wall and earthwork by subsequent construction and uncontrolled runoff until final acceptance substantial completion; repair damage due to failure to protect wall or earthwork.
- B. Do not operate heavy paving or grading equipment within 36 inches from the back of the wall face.
- C. Do not operate equipment with wheel loads in excess of 150 psf live load within 10 feet from the wall face.
- D. Do not place temporary soil or fill stockpiles adjacent to wall.
- F. Replace damaged units prior to Date of Final Acceptance. Damaged units shall be cause for rejection by the Owner.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

- A. The work of this section consists of furnishing and placing topsoil for turf areas to be seeded, fertilized, and mulched. No topsoil shall be furnished, nor will be paid for, under this section until all job-stockpiles have been exhausted.

**1.02 SUBMITTALS**

- A. SOIL ANALYSIS CERTIFICATES

Submit six (6) copies of soil analysis certificates covering grain size and additive recommendations from the State University Agricultural Extension Service or other certified testing laboratory.

**1.03 DELIVERY**

- A. PRODUCT HANDLING

Do not deliver topsoil in frozen or muddy condition.

**PART 2: PRODUCTS****2.01 MATERIALS**

- A. **TOPSOIL**

Natural, friable, loamy soil, typical of local topsoil which produces heavy vegetative growth; free from subsoil, weeds, sods, stiff clay, stones larger than 1 inch, toxic substances, litter, or other foreign material harmful to plant growth; having a pH between 6.0 and 7.0.

**GRADING ANALYSIS**

Sieve	Minimum Percent Passing
2 inch	100
No. 4	90
No. 10	80

Topsoil shall contain sand, silt, and clay as required by AASHTO M146.

	Minimum Percent	Maximum Percent
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Sand	20	75
Silt	10	60
Clay	5	30

### **PART 3: EXECUTION**

#### **3.01 PREPARATION**

##### **A. JOB CONDITIONS**

Do not perform tilling operations when ground is frozen or excessively wet.

#### **3.02 INSTALLATION**

##### **A. GENERAL**

1. Use equipment and methods to prevent damage to existing structures, utilities, lawns and plantings.
2. Prior to placing topsoil, shape the subgrade to graded lines, and cross sections to provide for 2 inches of compacted topsoil. Clear the subgrade of materials larger than 1/4" inch. Excavate to depth of 12 inches all areas that have become saturated with oil, gasoline, or bituminous products; backfill with approved material.
3. After alignment of subgrade, loosen and till to a depth of 6 inches by disking, harrowing, rototilling, or other approved methods.
4. After approval, place and spread topsoil to secure required depth after compaction; rake and remove materials larger than 1/4" inch. Compact with approved roller equipment. Finish smoothing even, and true to lines and grades indicated.

**END OF SECTION**

## **SECTION 32 92 19**

## **SEEDING AND MULCHING**

### **1. DESCRIPTION:**

1.1 The work covered by this section consists of furnishing all labor, materials, and equipment to perform all necessary operations to topsoil, fine grade, fertilize, mulch and maintain temporary and permanent seeding of all graded, cleared, or disturbed areas during construction. The work covered by this section shall be in conformance with Section 1660 of the "Standard Specifications for Roads and Structures" dated January 1, 2018, published by the North Carolina Department of Transportation and with Section 6.11 of the "Erosion and Sediment Control Planning and Design Manual" published by the Land Quality Section of the North Carolina Department of Environment and Natural Resources unless otherwise stated herein.

1.2 Related Work: See following sections for related work:

1. 31 11 00 - Clearing and Grubbing.
2. 31 22 00 - Grading
3. 31 25 00 - Erosion and Sediment Control.

### **2. MATERIALS:**

2.1 Topsoil: Topsoil shall be from stockpiles created from stripping and required excavation. Should additional topsoil be required in excess of that obtained from stripping and excavation, the contractor shall obtain material from other sources on the site where authorized by the Owner, or from approved sources off the site. The topsoil shall be natural, friable soil, possessing characteristics of representative soils in the vicinity which produce heavy growths of crops of grass. It shall be obtained from naturally well-drained areas, shall be reasonably free from subsoil, brush, objectionable weeds, and other litter and shall be free from toxic substances, clay lumps, stones, roots and other objects larger than 1/4" inch in diameter, or any other material which might be harmful to plant growth or be a hindrance to grading, planting, and maintenance operations.

2.2 Fertilizer: Fertilizer shall be the product of an approved commercial fertilizer manufacturer and shall be 5-10-5 grade, uniform in composition, free-flowing material suitable for application with approved standard equipment. The fertilizer shall conform to the applicable State fertilizer laws and shall be delivered to the site in bags or other convenient containers each fully labeled and bearing the name, trademark, and warranty of the producer.

2.3 Lime: Lime shall be ground limestone containing not less than 85% of total carbonates and shall be ground to such fineness that at least 50% will pass through a 100-mesh sieve and at least 90% will pass through a 20-mesh sieve. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve, but no additional payment will be made for the increased quantity.

- 2.4 Mulch: Mulch shall be straw from wheat or oats. Materials for securing mulch may be one of the following:
- 2.5 Mulch Netting: Lightweight plastic, cotton, jute, wire or paper nets shall be used.
- 2.6 Peg and Twine: Baling twine and soft wood pegs 1/2" x 1" x 12".
- 2.7 Liquid Mulch Binder: RC-2 cut back asphalt conforming to the requirements of Federal Specifications SS-A671A, and asphalt emulsion shall conform to the requirements of Federal Specification SS-A-674, Type V.
- 2.8 Seed: Seed used shall bear the official "certified seed" label inspected by North Carolina Crop Improvement Association. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable. The seed used shall be that shown in seeding schedule specified herein or on the plans.
- 2.9 Wire Staples:
- 2.9.1 Wire staples shall be a No. 9 staple and shall be at least 1½ inches long.
3. **Installation**:
- 3.1 Seedbed Preparation:
- 3.1.1 Clearing: Prior to or during grading and tillage operations, the ground surface shall be well drained, cleared of all brush, roots, stones larger than 2 inches in diameter, or any other material which may hinder proper grading, tillage, or subsequent maintenance operations.
- 3.1.2 Fine Grading: Areas to be seeded shall be graded as shown on the drawings or as directed and all surfaces shall be left in an even and properly compacted condition so as to prevent the formation of depressions where water will stand. Areas to be topsoiled shall be graded to a smooth surface and to a grade that will allow topsoiling to finished grade.
- 3.1.3 Topsoiling: Immediately prior to placing topsoil, the subgrade, where excessively compacted by traffic or other causes, shall be loosened by scarifying to a depth of at least 2 inches to permit bonding of the seeding and mulching to the subgrade.
- 3.1.4 Tillage: After grassed areas required to be seeded have been brought to the grades shown on the plans and as specified, they shall be thoroughly tilled to a depth of 3 inches by approved methods, until the condition of the soil is acceptable to the Engineer. Any objectionable undulations or irregularities in the surface resulting from tillage or other operations shall be removed before planting operations are begun. The work shall be performed only during periods when satisfactory results are likely to be obtained. When conditions are such, by reason of drought, excessive moisture or other factors, that results are not likely to be satisfactory, the Engineer will stop the work and it shall be resumed only when, in his opinion, the desired results are likely to be obtained.

### 3.2 Limestone, Fertilizer and Seed:

3.2.1 General: Seasonal limitations for seeding operations; the kinds and grades of fertilizers; the kinds of seed; the rates of application of limestone, fertilizer, and seed shall be as shown in the seeding schedule.

3.2.2 Equipment to be used for the application, covering, or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

3.2.3 Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.

3.2.4 During the application of fertilizer, adequate precautions shall be taken to prevent damage to structures or any other appurtenances. The Contractor shall either provide adequate covering or change methods of application as required to avoid such damage. When such damage occurs, the Contractor shall repair it, including any cleaning that may be necessary.

### 3.3 Limestone and Fertilizer: Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at a specified rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed.

3.3.1 If liquid fertilizer is used, storage containers for the liquid fertilizer shall be located on the project and shall be equipped for agitation of the liquid prior to its use. The storage containers shall be equipped with approved measuring or metering devices which will enable the Engineer to record at any time the amount of liquid that has been removed from the container. Application equipment for liquid fertilizer, other than a hydraulic seeder, shall be calibrated to insure that the required rate of fertilizer is applied uniformly.

### 3.4 Seeding: Seed shall be distributed uniformly over the seedbed at the rate indicated in the seeding schedule, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

3.4.1 When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.



3.4.2 When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.

3.4.3 Immediately after seed has been properly covered, the seedbed shall be compacted in the manner and degree approved by the Engineer.

3.5 Modifications: When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

3.5.1 Such modifications may include but not be limited to the following:

1. The incorporation of limestone into the seedbed may be omitted on (a) cut slopes steeper than 2:1 (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.

2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.

3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

3.6 Mulch:

3.6.1 General: All seeded areas shall be mulched unless otherwise indicated on the plans or directed by the Engineer. Application rate of mulch shall be indicated in seeding schedule.

3.6.2 Mulching: Mulch shall be applied within 36 hours after the completion of seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.

3.6.3 Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

3.6.4 Mulch Binding: Mulch shall be held in place using devices approved by the Engineer as per manufacturers recommendations. During application, the Contractor shall take adequate precautions to prevent damage to structures or appurtenances.

### 3.7 Maintenance:

3.7.1 General: The Contractor shall be responsible for the proper care and maintenance of the seeded areas until the work under the entire contract has been completed and accepted by the Engineer. Maintenance shall consist of repair and replacement of eroded areas, watering, refertilizing, reliming, reseeding, and remulching as necessary to provide an even, fixed growth of grass. In addition, the Contractor shall provide protection against traffic and shall erect the necessary barricades and warning signs immediately after planting is completed.

3.7.2 Mowing: The seeded areas shall be mowed with approved mowing equipment as per seeding schedule. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be removed at no cost to the Owner.

### 3.8 Inspection and Testing:

3.8.1 Fertilizer and Lime: The Engineer shall be furnished with duplicate copies of invoices for all fertilizer and lime used on the project. Invoices for fertilizer shall show the grade furnished. Invoices for lime shall show total minimum carbonates and minimum percentages of the material furnished that pass 100-mesh and 20-mesh sieve. Upon completion of the project, a final check of the total quantities of fertilizer and lime used will be made against the total area topsoiled and seeded, and if the minimum rates of application have not been met, the Engineer may require the distribution of additional quantities of these materials to make up the minimum application specified at no additional cost to the Owner.

3.8.2 Seed: The Engineer shall be furnished duplicate signed copies of a statement from the Vendor, certifying that each container of seed delivered is fully labeled and in full accordance with the specifications in this section and the seeding schedule.

**END OF SECTION**

# **DIVISION 33**

## **UTILITIES**



## **SECTION 33 11 00**

## **WATER PIPE AND APPURTENANCES**

### **PART 1: GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of ductile iron water lines in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein.
- B. All water pipe excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.
- C. All waterline installation shall conform to this specification and any standards and specifications that have been adopted by the local water authority. It is the contractor's responsibility to verify with the local water authority if any superseding standards and specifications are applicable.
- D. All materials that come in contact with potable water shall meet the requirements of NSF61.

#### **1.02 SUBMITTALS**

- A. The Contractor shall provide six (6) copies of shop drawings or submittals for the following:
  - 1. All sizes and types of pipe on the project.
  - 2. Pipe fittings, valves, meters and boxes, vaults, backflow preventers, and necessary appurtenances.

#### **1.03 DELIVERY, STORAGE AND HANDLING**

- A. The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if damaged sufficiently, the Engineer will reject the material as being unfit for installation.
- B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

#### **1.04 WARRANTY**

All materials shall be guaranteed to be free from defects in materials and workmanship for a period of one (1) year after final acceptance by the Owner.

## **PART 2: PRODUCTS**

### **2.01 MATERIALS**

#### **A. DUCTILE IRON PIPE**

1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.
3. Ductile Iron Pipe shall be manufactured in accordance with AWWA C151. All Ductile Iron Pipe shall be 350 psi Class unless otherwise specified and shall be lined with a cement mortar lining not less than 1/16" thick conforming to AWWA C104. Pipe wall thickness for all Ductile Iron Pipe shall conform to "Thickness Design for Ductile Iron Pipe," AWWA C150. The standard laying condition shall be type 2. The exterior of all Ductile Iron Pipe shall have a protective coating of a coal tar or asphaltic material a minimum of 5 mils thickness conforming to AWWA C110 and C115.
  - a. Flanged Joints:
    - i. Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe.
    - ii. Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and covered with coal tar pipe varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with wire brushed before installation of pipe.
    - iii. Ductile Iron Flanged joint pipe shall have a thickness of Class 53 minimum and shall conform to AWWA C110 and

AWWA C115. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field. All pipe shall have 125 lb. flanges conforming to AWWA C110 unless otherwise specified.

- iv. In general, flanged joints shall be made up with through bolts of the required size. Stud or tap bolts shall be used only where shown or required. Steel or tap bolts shall be cadmium plated, with good and sound, well-fitting threads, so that the nuts may be turned freely by hand. Cadmium plating shall be by an approved process with a plate thickness of 0.0003" to 0.0005".
- v. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the installer of piping for joints connecting the piping with equipment and piping is furnished by the installer or not.

b. Mechanical Joints:

- i. All mechanical joint pipe shall be manufactured in accordance with AWWA C111. Pipe shall be manufactured in accordance with AWWA C151, and the pipe thickness shall be 350 psi Class as determined by AWWA C150 unless otherwise noted.
- ii. All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.
- iii. Bolts for mechanical joints shall be high grade steel, low alloy type, with tee or hex head and American Standard threads. Mechanical joint gland shall be gray iron and shall utilize a plain rubber gasket.

c. Slip Joints:

- i. Slip or "push-on" joints shall be manufactured in accordance with AWWA C151. Pipe thickness shall be 350 psi Class as determined by AWWA C150.
- ii. Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe

manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell. No joint may exceed a maximum deflection of 4%.

4. Fittings:

- a. All ductile iron pipe fittings for pipe shall be mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping. Where flanged pipe is used ductile iron fittings shall be flanged in accordance with AWWA C110 for exposed piping. All flanges shall be Class 125 unless otherwise noted.
- b. All fittings shall be lined with cement mortar not less than 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.
- c. All mechanical joints shall be manufactured in accordance with AWWA C111.

B. POLYVINYL CHLORIDE (PVC) PIPE (1-Inch Up To 4-Inch)

1. All pipe 4 inches or larger to be Ductile Iron Pipe.
2. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
3. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.
4. Pressure Rated PVC Pipe shall be manufactured in accordance with AWWA C900 and ASTM 2241. All Pressure Rated PVC Pipe shall have a standard dimension ratio (SDR) as indicated in the drawings. The exterior of all PVC Pipe shall bear a stamp which shows SDR and size.
  - a. All pipes shall have slip or "push-on" joints which are manufactured in accordance with AWWA C151. Pipe shall have a bell with integral rubber gasket.

- b. Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until the assembly mark on the pipe barrel is flush with the end of the bell. No joint may exceed a maximum deflection of 4%.
- 4. Fittings:
  - a. Fittings for all PVC pipe shall be ductile iron pipe fittings, mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping.
  - b. All fittings shall be lined with cement mortar not less than 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.
  - c. All mechanical joints shall be manufactured in accordance with AWWA C111. The Contractor shall provide suitable 3" plugs with stainless steel threaded nipples and sleeves for connection of fittings.
- 5. All valves and appurtenances shall comply with NSF61/NSF372.
- 6. All non-ferrous pipe shall be installed with 19-gauge Trace Safe tracer wire or approved equal. Tracer wire will be installed one foot above the top of the pipe and shall be connected to valve boxes and appurtenances per manufacturer requirements.



## **PART 3: EXECUTION**

### **3.01 INSTALLATION**

#### **A. EXCAVATION**

1. Trenches will be defined as all excavation for the installation of water pipe, hydrants, valves, water services, water taps, and other unclassified excavation as may be deemed necessary by the Engineer.
2. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.
3. All excavation shall be by open cut unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #67 washed stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless as otherwise authorized by the Engineer, as measured at a depth of 2'-0" above the top of the pipe shall be 30" or 10" clearance from each side of the pipe, whichever is greater.
4. Sheeting, Bracing Trenches, and Trench Boxes:

If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required, for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place. The Contractor shall provide all means necessary to comply with the latest OSHA requirements.

5. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom. If the Engineer is of the opinion, that at any point, sufficient or proper supports have not been provided, he may order additional supports put in at the Contractor's expense, but compliance with such orders shall not release the Contractor from responsibility for the sufficiency of such supports.
6. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.
7. Materials which are excess to the needs of the project will be disposed of by the Contractor.
8. In order to protect existing pavement structures and to make clean-up easier the Contractor shall place a 6" layer of sand on all asphalt or concrete surfaces prior to placing excavated material.
9. Pipe Foundations:
  - a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed. Unless otherwise noted all pipe shall be installed using a "Type 2" trench foundation as defined in AWWA C151.
  - b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer. When an Inspector is present on the site and is so requested by the Contractor, he shall check the position of grades and lines but the Contractor shall be responsible for the finished work conforming to exact and proper line and grade.
  - c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the

length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.

- d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and #67 washed stone of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.
- e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". #67 washed stone shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
- f. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with #67 washed stone as approved by the Engineer.
- g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.
- h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on a washed stone or concrete cradle foundation. Such foundations whether washed stone or a poured concrete cradle, shall be placed by the Contractor and compensation will be allowed the Contractor for the work.

## B. INSTALLING PIPE AND APPURTENANCES

### 1. Laying Pipe:

- a. All piping is to be installed in strict accordance with the manufacturer's recommendations and AWWA C600, AWWA C605,

and the contract material specifications. Installation manuals from various material suppliers will be furnished the Engineer for his review and approval prior to installation of any materials. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

- b. No pipe shall be laid except in the presence of the Engineer or his Inspector, or with special permission from the Engineer.
- c. Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line.
- d. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
- e. When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the center line of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.
- f. All pipe joints shall be constructed in strict accordance with the pipe manufacturer's specifications and materials and any deviation must have prior approval of the Engineer.
- g. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 4° be allowed.
- h. All water lines shall have a minimum cover of 3'-0" unless otherwise approved by the engineer. All water lines shall have a minimum 18" vertical separation from storm sewer and shall have a minimum of 10'-0" horizontal separation from sanitary sewer or 18" vertical separation with the water line over the sewer line. In the event these separations cannot be met, both water line and sanitary

sewer shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings.

2. Thrust Blocks:

- a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer, or as per City of Asheville standards. Thrust blocks shall be made of ready mix concrete having a compressive strength of 28 days of 4000 psi and shall bear directly against the undisturbed trench wall. Where possible, the concrete shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20 mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.
- b. Concrete for thrust blocks shall consist of a ready mix of Portland Cement, Fine Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 4000 psi when tested in accordance with ASTM C39 or C42. Sakrete or any similar material will not be permitted under any circumstances.

C. BACKFILLING AND COMPACTION

1. Backfill trenches immediately after approval of the pipeline construction.
2. Use select backfill carefully placed in uniform layers not exceeding 6" in thickness to a depth of 2'-0" over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten as necessary; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2'-0" over top of pipe to top of trench, shall be backfilled with a select material containing no rocks larger than 6" in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4" in diameter will be allowed.
3. Moisten backfill as necessary above 2'-0" over the top of the pipe and place in 8" layers. Compact each layer with hand, pneumatic or mechanical

compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.

4. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the maximum dry density as determined by Standard Proctor Test for the various types of backfill material for the full trench depth in non-paved areas. In paved areas, backfill shall be compacted to 98% of the maximum dry density as determined by Standard Proctor Test for the top 24" below subgrade. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.

5. Roadways and Road Crossings:

Use select backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (98% for the top 2'-0" of sub grade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and type as the adjacent roadway.

6. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from roots, stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
7. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes miss-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
8. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
9. Cleanup:
  - a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all

rubbish and excess material and leave area in a neat, satisfactory condition.

- b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 L.F. of water line may be laid prior to completion of cleanup of the first section of pipeline laid. To facilitate this the Owner reserves the right to withhold up to 30% of the unit price bid for water line if in the opinion of the Owner and Engineer completed sections have not been properly cleaned.

### **3.02 QUALITY CONTROL**

#### **A. TESTING**

1. General: Perform all hydrostatic testing in accordance with AWWA C600, Section 4, unless otherwise specified. When a section of pipe of a length deemed adequate by the Engineer is ready for testing, blow the line free from air and conduct a leakage test. All new water service connections, from taps on the main up to and including meter yokes, meter setters and spool piece for meters in vaults, shall be installed and included in the hydrostatic testing and disinfection processes.
2. Buried Lines: Whenever conditions permit in the opinion of the Engineer, test pipelines before the trench is backfilled. All joints may then be examined during open trench test and all leaks entirely stopped. Should the Contractor wish to minimize the maintenance of lights, and barricades and the obstruction of traffic, he may, at his own risk, backfill the entire trench as soon as practicable after installation of pipe. The Contractor, however, remains responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints of pipe.
3. Exposed Lines: Test all exposed lines prior to field painting.
4. Temporary Bulkheads: Furnish, install and remove all temporary bulkheads, flanges, or plugs necessary to permit the required pressure test. Install corporation stops at all high points on the line for blowing lines free from air. Install corporation stops at the test pump location. Install a test pump and means for accurate measurement of water introduced into the line during testing. Keep pump, meters, and gages in use during pressure and leakage tests.

5. Test Pressure and Allowable Leakage: Keep the section to be tested full of water for a period of 24 hours before the pressure and leakage tests are conducted.
6. Hydrostatic Testing: A section of line which is to be hydrostatically tested, shall be slowly filled with water at a rate which will allow complete evacuation of air from the line. Hand pumps shall not be used for the pressure testing of water mains.
  - a. The hydrostatic test shall be witnessed by the Water Engineering Division during the full two-hour duration.
  - b. The line shall be tested to a minimum pressure of 200 psi with a maximum of 250 psi at the lowest elevation for a duration of 2 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10 psi or less. Pressure shall be maintained at a minimum of 200 psi +/- 5 psi at the highest point throughout the duration of the test by pumping additional water into the test section as often as necessary. At the end of the test period, the leakage shall be measured with an accurate water meter furnished by the City, or other approved means.
  - c. The line to be tested must utilize a backflow prevention assembly. All water for testing must be drawn through this assembly. Prior to connecting to the existing water line the new water line extension shall be pressure tested, disinfected and a clear water sample obtained.
  - d. **The allowable leakage shall be no more than indicated in the table below. Allowable leakage based on the formula:**

$$L = [S * D * (P)^{1/2}] / 148,000$$

L = testing allowance (makeup water), in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

ALLOWABLE LEAKAGE PER 1000 FEET OF PIPELINE (GPH)													
Avg. Test Pressure PSI	Pipe Diameter in Inches												
	3	4	6	8	10	12	14	16	18	20	24	30	36
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85
225	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65



200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98
125	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43

e. All visible leaks are to be repaired regardless of the amount of leakage.

7. Defective Materials and Workmanship: Carefully examine all exposed pipe fittings, valves, hydrants, and joints during the test. Locate and repair leaks and replace defective materials if the water loss during the test periods exceeds the allowable leakage. Make the necessary repairs, replace defective material and repeat the hydrostatic test until the leakage does not exceed the allowable leakage as defined herein.

## B. STERILIZATION

1. Disinfection to be in compliance with AWWA C651.
2. All new water service connections, from taps on the main up to and including meter yokes, meter setters and spool piece for meters in vaults, shall be installed and included in the hydrostatic testing and disinfection processes.
3. All additions or replacements to the water system shall be chlorinated before being placed in service. Such disinfection shall take place under the continuous supervision of the Engineer or Engineer's Inspector. The maximum total length of water main which may be disinfected at the same time is 3000 linear feet.
4. Disinfection, flushing and sampling of a completed line shall be carried out in the following manner:
  - a. Taps with extended copper tubing will be made at the control valve at the upstream end of the line and at all extremities of the line including valves. These additional taps will not be necessary where a suitable permanent tap is already available as approved by the City.
  - b. Prior to introducing the chlorine solution into the pipe, all blow-offs shall be checked to confirm that all air has been expelled from the pipe and the pipe is filled with water. During the introduction of chlorinated solution into the pipe, the operation of blow-offs shall be carefully controlled to make sure the

solution enters all main lines, branch lines, and service lines thoroughly and that no air is introduced.

- c. All gauge pressure and residual chlorine field test equipment shall be properly calibrated. All equipment used in the disinfection process shall be cleaned and suitable for potable water application.
- d. A solution of water containing high test sodium hypochlorite (70% available chlorine) shall be introduced into the line by regulated pumping at the control-valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of 50 ppm total chlorine immediately after disinfection. The chart below shows the required quantity of 70% HTH compound to be contained in solution in each 1000 feet section of line to produce the desired concentration of 50 ppm.

PIPE SIZE, INCHES	POUNDS HIGH TEST HYPOCHLORITE (70%) PER 100 FEET OF LINE
6	0.88
8	1.56
10	2.42
12	3.50
14	4.76
16	6.22
20	9.76
24	14.00

- e. Once the new main is uniformly chlorinated at the required concentration as confirmed by the Water Engineering Division Inspector, entrances and blow-offs shall be properly secured and the solution shall be retained in the system for a minimum of 24 hours, during which time all intermediate valves and hydrants shall be operated several times to insure disinfection of the inside faces of these appurtenances. At the end of the 24-hour period, the Inspector shall check entrance points and blow-offs to insure that the pipe is still full of solution without trapped air and the solution at each point checked has retained a chlorine residual of not less than 10 mg/l.
- f. Following the 24-hour period, with the approval of the Inspector, the chlorine solution shall be thoroughly flushed from the new main. Flushing shall not be completed until the residual chlorine measured by the Inspector at the end points of the new main has a measured chlorine residual within +/- 0.5 mg/l of the water supplied for flushing from the active water main.

- g. Disposal of the chlorinated solution during flushing shall comply with all federal, state, and local regulations. Where a sanitary sewer is located nearby, with the approval of the sewer authority, the chlorinated solution may be discharged to the sanitary sewer with a positive air gap to prevent backsiphonage. Disposal directly to surface waters without removal of chlorine is strictly prohibited.
  - h. After flushing is completed as described in f) above, the new water mains shall be isolated without introducing air by closing all entrance and blow-off points and allowing the new water mains to sit for another 24-hour period. At the end of this 24-hour period, an authorized employee of an accredited testing firm shall collect samples from randomly selected end points of the new water mains and perform bacteriological analysis of the samples in a state-approved certified laboratory. Results of the testing shall be documented and certified by the signature of the laboratory technician and Water Production Supervisor or Superintendent. Test results shall be provided to the contractor and Water Engineering Division. The disinfection process is not completed until the results of all testing are certified as negative for bacteriological contamination.
  - i. If the bacteriological tests fail to produce satisfactory results, the new main shall be reflashed by repeating steps f) through h) above. If bacteriological tests fail the second time, the entire disinfection process shall be repeated.
5. For mains required to be immediately returned to service after disinfecting, take a bacteriologic sample after connection or repair to provide a record by which the effectiveness of the procedure used can be determined.

**END OF SECTION**

## **SECTION 33 12 00**

## **WATER VALVES AND APPURTENANCES**

### **PART 1: GENERAL**

#### **1.01 SCOPE OF WORK**

- A. This specification covers the requirements for furnishing and installing valves and other appurtenances for the various water system improvements shown on the Drawings.
- B. Furnish all labor, equipment, materials and incidentals necessary to install and complete water valve and appurtenance installation in accordance with the plans and specifications. All valves and appurtenance material shall be of the type and class specified herein.
- C. All water valve and appurtenance excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.
- D. All valves and appurtenances shall conform to current NCDENR Standards and Specifications.

#### **1.02 SUBMITTALS**

The Contractor shall provide six (6) copies of shop drawings or submittals for the following:

- 1. All valves, valve boxes, hydrants, air relief valves, tapping sleeves, meters, manholes, or any other items required for completion of the project.

#### **1.03 DELIVERY, STORAGE AND HANDLING**

- A. The Contractor shall unload valves and appurtenances so as to avoid deformation or other injury thereto. The Contractor shall store valves and appurtenances above storm drainage levels. All valves shall be drained and so stored as to protect them from freezing.
- B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

#### **1.04 WARRANTY**

All materials shall be guaranteed to be free from defects in materials and workmanship for a period of one (1) year after final acceptance by the Owner.

## **PART 2: PRODUCTS**

### **2.01 MATERIALS**

#### **A. BALL VALVES**

Ball valves shall be installed on existing/new 2" water main and service lines and all conform to AWWA C800. Valves shall be made of heavy brass components with a PTFE coated ball on a "blow-out" proof stem with double O-ring seals, and shall be rated for 300 psig working pressure. Operating nut shall be "curb key" design for quarter turn open or close and shall open left. Ball valves shall be as required on the Approved Manufacturers Products List.

#### **B. GATE VALVES**

All gate valves shall be designed for a minimum working pressure of 200 psi unless otherwise specified. Valves shall have a clear waterway equal to the full nominal diameter of the pipe. Valves shall be opened by turning counterclockwise. Each valve shall have the initials or name of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by hand wheel for above ground installations or 2" square operating nut for below ground installations. Valves shall have an arrow cast in the metal indicating the direction of opening.

Valves to be installed underground (Buried) shall be of the non-rising stem type and shall have mechanical joint connections.

Valves installed above ground or in structures shall have rising stems with outside stem and yoke and 18" diameter minimum hand wheel and shall have flanged ends with 125# flanges unless others noted.

##### **1. Gate Valves Smaller than 2"**

- a. Gates valves smaller than 2" shall be all brass, single disc type, double seat tapered wedge type built to manufacturer's standards with material and construction conforming to AWWA C-500.
- b. Each valve shall have a 2" operating nut. Valves shall have screwed ends conforming to NPT standards.

##### **2. Resilient Seated Wedge Valve**

- a. Gate valves 2" through 24" diameter size shall be of the ductile iron body, resilient seated wedge type meeting the requirements set

forth in AWWA C-509 and AWWA C-500. All valves shall be from one manufacturer and parts interchangeable.

- b. Gate valves shall have body, bonnet and gate manufactured of ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in Table 2, Section 4.4 of AWWA C-509 and C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces with a fusion bonded epoxy paint conforming to AWWA C-550.
- c. The gate shall be fully covered with a rubber cover over all exterior and interior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The gate and rubber coat shall conform to ASTM D429.
- d. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.
- e. Valves larger than 12" diameter shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve.

### 3. Double Disc Type Gate Valves

- a. Gate valves larger than 24" diameter size shall be of the ductile iron body, double disc parallel seat type meeting the requirements set forth in AWWA C-500. All valves shall be from one manufacturer and parts interchangeable.
- b. Gate valves shall have body, bonnet and gate manufactured of ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces.
- c. The gates shall be high strength cast iron, sturdily proportioned without pockets on the backs. All cam surfaces shall open to the bottom. Gate rings shall be rolled into a dovetail groove under pressure to make a single insertable finish.

- d. Valves shall use bottom wedging type design with a two-part floating wedge contact. The wedge and hook shall be separate castings and not a single piece.
- e. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.
- f. Valves shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve. Valves shall have bronze rollers, tracks, and scrapers.
- g. All valves shall be supplied with a bypass as a part of the valve. Bypass shall be a minimum of 3" diameter with a 3" resilient seated wedge valve.

#### C. VALVE BOXES

All valve boxes shall be cast iron and shall conform to ASTM A48. Valve boxes shall be of the adjustable screw type with a base to fit the valve yoke with a removable cover with the word "water" cast thereon.

#### D. FIRE HYDRANTS

##### 1. GENERAL:

- a. All fire hydrants shall meet or exceed the requirements of AWWA C-502, be listed by Underwriters Laboratories, Inc. and have Factory Mutual Research approval. All hydrants shall be rated 250 PSI working pressure minimum and be tested to 500 PSI minimum. The rated working pressure shall be cast on the hydrant barrel. Hydrants shall be of the compression type, constructed such that the main valve closes with water pressure to assure no loss of water in the event of damage to the upper portion of the hydrant. The diameter of the main valve seat shall be four and one-half inches (4 1/2") minimum. The hydrant shall open counter clockwise against the pressure and close clockwise with the pressure.
- b. The bonnet assembly shall have a lubrication reservoir which is sealed from the waterway and all external contaminants by the use of "O" ring seals. A port to add lubricant to the reservoir, without removal of the bonnet, is required.

- c. Fire hydrant shall be manufactured with 1 1/2-inch Pentagon operating nut and thrust nut made of low zinc bronze complying with ASTM B-61, B-62 or B-96, with thrust bearings located both above and below the thrust collar and with operating nut protected by a cast iron weather shield. In lieu of the bronze operating nut, an integral ductile iron operating nut and weather shield will be acceptable.
- d. Hydrants shall be a 3-way type with two (2) outlet nozzles, two and one-half inches (2 1/2") NST and (1) Steamer nozzle four and one-half inches (4 1/2") NST. All nozzles shall be made of low zinc brass complying with ASTM B-61, B-62 or B-96. All nozzles shall be mechanically locked into the barrel and have "O" ring pressure seals. Caps shall be provided with chains and chain hooks.
- e. The hydrant shall have a traffic "breakaway" coupling which is designed to fracture when the hydrant is impacted by a vehicle. The breakaway coupling shall be made of cast iron or steel and shall allow for 360-degree rotation of the upper barrel to position the nozzles without removing the breakaway coupling or shutting down. All pins, clips, and or retainer rings associated with the "breakaway" coupling shall be stainless steel.
- f. The main valve seat shall have bronze to bronze seating arrangement of low zinc bronze complying with ASTM B-61, B-62 or B-96. A bronze seat ring shall be threaded into bronze sub-seat located in the hydrant elbow. All "O" rings sealing the main valve seat ring shall bear against a non-corrodible low zinc bronze surface.
- g. The main valve assembly shall include double drain valves to operate automatically each time operated without the aid of springs, pins or toggles. The valve upper plate and valve lower plate shall be made of ductile iron or low zinc bronze complying with ASTM B-61, B-62 or B-96. The entire valve and stem assembly must be capable of removal and reassembly by the use of a small lightweight wrench without disassembly of the upper barrel.
- h. The shoe casting, lower barrel casting, and flanges below ground shall be manufactured in accordance with ASTM A- 126, Class B, Grey Iron or Ductile Iron. All ferrous metal surfaces in the hydrant shoe are to be fully coated with a minimum four (4) mills epoxy not to exclude the lower valve plate assembly.



- i. The hydrant will have three and one-half foot (3 1/2') of bury, unless otherwise noted. The hydrant will have a six inch (6") inlet connection of the (mechanical joint) type, unless otherwise noted. Painting and coating of the hydrant shall be as prescribed in AWWA C-502, latest revision. The color above the ground line flange shall be YELLOW.
- j. Fire hydrants shall be as required in the Approved Manufacturers Products List.

E. AIR RELIEF VALVE

- 1. The air release valve shall fully conform to AWWA C512 (latest revision) and suitable for use with clean water. It shall be float operated and automatically release accumulated air from the pipeline or system while in operation and under pressure.
- 2. Valves with 1" (25mm) or larger connection size shall be compound lever type with adjustable seat, smaller size valves shall be simple lever type.
- 3. The valve's venting orifice diameter shall be selected for 300 PSI (2,069 KPa) maximum working pressure.
- 4. The valve body and cover shall be rated for 300 PSI (2,069 KPa) and made from cast iron conforming to ASTM A126 Class B.
- 5. The float ball, orifice and internal linkage mechanism shall be made from Type 316 stainless steel. Non-metallic components are not acceptable.
- 6. The seat shall be replaceable and made from Buna-N rubber or other suitable elastomer compounds.
- 7. The exterior of the valve shall be shop coated with enamel primer.

F. MANHOLE SECTIONS AND APPURTENANCES

- 1. Precast concrete manhole bases, risers and cones shall conform to ASTM C478, latest revision, for precast reinforced concrete manhole sections. Tapered sections and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.

2. Minimum compressive strength of concrete shall be 4000 psi and the maximum permissible absorption shall be 6.5%. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole sections shall fit together readily and shall have a self-contained "O"-ring rubber gasket conforming to ASTM C443.
3. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Engineer and his inspector. The manhole sections shall be perpendicular to their longitudinal axis, within the limits listed in ASTM C478.
4. Castings for manhole frames and covers shall be tough, even grained soft gray iron, free from burnt on sand and other injurious defects and conform to the requirements of ASTM A48, latest revision, Class 30, with "WATER" cast into the cover.
5. Brick for manholes and other structures shall conform to applicable requirements of ASTM C62, latest revision, Grade SW.

#### G. TAPPING SLEEVE AND VALVE

1. Tapping sleeves shall consist of two piece split ductile iron, jointed by bolts manufactured of high strength cast iron and incorporating a longitudinal compound rubber gasket. The sleeves shall include split end gasket and two piece mechanical joint glands suitable for the class of pipe around which sleeves are to be placed. Glands will be joined by steel bolts and fastened to the bell openings of the sleeves to form totally enclosed rubber water tight seals around the periphery of the pipe and along the longitudinal joints.
2. The sleeves shall have flanged outlets which will accommodate the tapping valves. Valves will be identical to resilient wedge gate valves elsewhere specified with inlet and outlet ends adaptable to the tapping machine and to provide mechanical joint connections to discharge pipes.

#### H. HYDRAULIC CHECK VALVE

1. GENERAL: Check valves shall be swing-check type conforming to AWWA C508. Valves conforming to AWWA C508 shall have iron body and cover and fully bronze mounted stainless steel hinge pins. Valves shall

have clear port opening. Valves shall be spring loaded and shall have flanged ends.

2. CASTING MARKINGS: Cast integral with either the bonnet or the body, the manufacturer's identification, the size of valve, the year of manufacture, and the maximum working pressure.
3. PAINTING: Coat all ferrous parts of the valves, except finished or bearing surfaces, with 2 coats of coal-tar varnish pipe dip or other approved material. After the valves are assembled and tested apply a third coat to the exterior.
4. TESTING: Test each valve at the manufacturer's plant for performance in water tightness and resistance to distortion under internal pressure. Subject each valve to hydrostatic tests under pressure at the working pressure cast on the valve and at 350 PSI.

I. All valves and appurtenances shall comply with NSF61/NSF372.

### **PART 3: EXECUTION**

#### **3.01 INSTALLATION**

##### **A. EXCAVATION**

1. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated in the construction of trenches.
2. Trenches will be defined as all excavation for the installation of storm sewers, sanitary sewers, water pipe, manholes, catch basins, hydrants, watergates, sewer services, water taps, drainage structures, drainage ditches and other unclassified excavation as may be deemed necessary by the Engineer.
3. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.

4. All excavation shall be by open cut unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with suitable bedding material thoroughly compacted in place. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless otherwise authorized by the Engineer, as measured at a depth of 2'-0" above the top of the pipe shall be 18" clearance on each side of the pipe.

5. Sheeting, Bracing Trenches, and Trench Boxes:

If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench, in such manner as the Engineer may direct to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides of the pipe. Also, the Contractor may be required as directed by the Engineer for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place.

6. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom. If the Engineer is of the opinion, that at any point, sufficient or proper supports have not been provided, he may order additional supports put in at the Contractor's expense, but compliance with such orders shall not release the Contractor from responsibility for the sufficiency of such supports.
7. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated

material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.

**B. INSTALLING VALVES AND APPURTENANCES**

**1. Thrust Blocks:**

- a. All plugs, caps, tees, bends, reducers and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer. Thrust blocks shall be made of concrete having a compressive strength of 28 days of 4000 psi and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.
- b. Concrete for thrust blocks shall consist of a mix of Portland Cement, Fine Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 4000 psi when tested in accordance with ASTM C39 or C42. Sakrete or any similar material will not be permitted under any circumstances.

**2. Valves:**

Before setting each valve, the Contractor shall make sure the interior is clean and test opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the plans, and at the exact locations shown. Trench backfill shall be tamped thoroughly for a distance of 3'-0" on each side of valves boxes.

**3. Valve Boxes:**

A valve box shall be installed over each underground valve. All boxes shall be set plumb with their top flush with finished grade.

4. Fire Hydrant:

Fire hydrants shall be located as shown. Each hydrant shall be connected to the main with a 6" branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18" above the finished grade. Hydrants shall be thoroughly blocked with concrete or shall be rodded to the 6" branch tee. Unless otherwise specified, the backfill around hydrants shall be thoroughly compacted to the final grade immediately after installation in order to put the hydrant into service as soon as practicable. Not less than seven (7) cubic feet of clean crushed stone shall be placed around the base of the hydrant to insure drainage of the hydrant barrel. A cap block shall be set under the fire hydrant foot for a solid bottom.

5. Air Relief Valves:

Each air relief valve shall be installed at the exact location shown in a plastic meter box with cast iron lid.

6. Jumper:

A backflow prevention and testing device or a "jumper" is required at all potable water tie-in while water main extension is under construction per CDC detail.

C. BACKFILLING AND COMPACTION

1. Backfill trenches immediately after approval of the pipeline construction.

2. Roadways and Road Crossings:

Use select backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (98% for the top 24" of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent roadway.

3. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the Standard Proctor Test (98% for the top 24" of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall

have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.

4. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
5. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.
6. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.
7. Cleanup:

Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

### **3.02 QUALITY CONTROL**

#### **A. TESTING**

Testing of valves and appurtenances shall be incidental to the testing of the water lines, and shall be performed as part of that testing.

**END OF SECTION**

## **SECTION 33 12 13**

## **DOMESTIC WATER SERVICE CONNECTION**

### **PART 1: GENERAL**

#### **1.01 SCOPE OF WORK**

The work covered under this section shall consist of furnishing all materials, labor, equipment and services for the complete installation of a domestic water service connection from the water main line to the property to be served.

### **PART 2: PRODUCTS**

#### **2.01 MATERIALS**

- A. The service line shall be constructed of Type "K" flexible copper tubing.
- B. Corporation stops shall be constructed of brass.
- C. Meter box shall be of round style and made of Polyvinyl Chloride Plastic with a minimum wall thickness of .375". Meter box shall be sized to accept a 5/8" water meter and shall have a minimum inside diameter of 18" with a 30" depth. Meter box shall have a non-locking cast iron lid.
- D. The inlet and outlet pipes that pass through the box wall shall be brass and shall be locked in place with brass hex nuts on straight external pipe threads. The inlet and outlet of these nipples shall have external tapered pipe threads and shall be protected by Polyethylene Cap Plugs. An In-Line quarter turn shut off valve with internal tapered pipe thread inlet and water meter coupling outlet shall be used upstream of the water meter. The valves shall be soft seating with a padlock wing. The valves internal components shall be removable from the top of the valve body. An In-Line Dual Check Valve with independent acting checks shall be used downstream of the water meter. The check valve shall have a meter coupling inlet and shall be contained inside the box. The internal parts of the check valve shall be removable without disconnecting the check valve the outlet piping. All brass materials used in contact with the water shall have a minimum copper content of 80% and a maximum zinc content of 10%.
- E. All domestic water services and connections shall conform to current local municipality standards and specifications.



## **PART 3: EXECUTION**

### **3.01 INSTALLATION**

- A. The standard service connection shall connect to the main at a brass corporation stop tapped to the main line.
- B. The water service line shall be constructed of Type "K" flexible copper tubing placed at a depth providing a minimum cover of 3'-0".
- C. The meter box unit shall be a complete unit with all pipe nipples, valves, yoke, and bottom installed and connected prior to delivery.
- D. Meters shall be provided and installed by the local municipality. Meters shall be furnished as specified on the drawings.

**END OF SECTION**

**PART 1: GENERAL****1.01 SCOPE OF WORK**

This section covers providing and installing the storm drainage and underdrainage collection systems, including pipe culverts, French drains and appurtenant structures. Storm drainage systems shall be constructed as shown on the Contract drawings and as specified herein.

**1.02 DELIVERY, STORAGE AND HANDLING****A. UNLOADING AND HANDLING**

All pipe and storm drainage material shall be unloaded and handled with reasonable care. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during unloading or handling, the undamaged portions of the joint or section may be used where partial lengths are needed, or if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation and the Contractor shall remove such rejected pipe from the project.

**1.03 SUBMITTALS**

- A. The Contractor shall submit for approval of the Engineer shop drawings, which describe in detail the materials to be utilized before ordering. Six (6) copies of shop drawings shall be submitted. Prior to submittal all shop drawings are to be reviewed by the Contractor, and shall be stamped and signed as to compliance with the referenced specification. Any variance to the specification shall be noted.

The following shop drawings shall be submitted:

1. Drainage Pipe
2. Underdrain Pipe
3. Underdrain or Pipe Bedding
4. Drainage Structure Castings
5. Precast Drainage Structures
6. Frame, grate and hoods

**1.04 WARRANTY**

All pipe and materials shall be warranted for a period of one (1) year following installation and acceptance by the Owner.

## **PART 2: PRODUCTS**

### **2.01 REINFORCED CONCRETE PIPE**

- A. Reinforced concrete pipe shall conform to ASTM C-76, latest revision. Pipe shall be Table III or Table IV with Wall B, unless otherwise noted. All pipe shall have interior surfaces free from roughness, projection, indentations, offset or irregularities of any kind.
- B. Joints shall be sealed with a plastic cement putty meeting Federal Specification SS-S-00210, such as Ram-Nek or a butyl rubber sealant. Joint material for reinforced concrete pipe shall comply with ASTM C 443 and shall be either "O" ring type joints utilizing a rubber "O" ring, or bell and spigot type utilizing a mastic joint material equal to Ram-Neck.

### **2.02 CORRUGATED METAL PIPE**

- A. All corrugated metal pipe shall be aluminized type 2 corrugated steel conforming to AASHTO M-274 latest revision unless otherwise called out on the design drawings. If called out as bituminous coated, pipe will conform to AASHTO M190, latest revision. Pipe shall be fully bituminous coated with an asphalt paved invert. Bituminous coating, shall consist of asphalt cement having a minimum thickness of 0.04" measured at the crest of the corrugations. Paved inverts in corrugated metal pipe, shall consist of asphalt cement applied on the inside of the pipe for one quarter of its circumference (bottom of pipe when installed). The pavement shall have a minimum thickness of 0.50" tapering to 0.1" at the sides. If pipe is called out as plain, non-coated, it shall conform to AASHTO M-36 latest revision.
- B. Corrugated metal pipe shall have 2-2/3" x 1/2" corrugations and shall be of the following minimum gauges:

18" and smaller pipes .....	16 gauge
21" - 30" pipes.....	14 gauge
36" - 48" pipes.....	12 gauge
56" and larger pipes .....	10 gauge

Corrugated Metal Pipe shall have rerolled ends to accommodate corrugated coupling bands. Coupling bands shall conform to NCDOT 932-3(A) installed with a minimum of two corrugations per pipe. Dimple bands shall not be used.

### **2.03 HIGH DENSITY POLYETHYLENE PIPE**

All HDPE shall be water tight type "S" Hancor Blue Seal or approved equivalent and installed according to manufacturers specifications. Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252, M294, and MP7. Pipe and fittings

shall be made from virgin PE compounds which conform with the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM F667. Pipe shall have smooth wall interior unless otherwise specified.

The fittings shall not reduce or impair the overall integrity of function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as tees, wyes and end caps. These fittings may be installed by various methods such as snap-on, bell and spigot, bell – bell and wrap around couplers. Couplers shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation of the joints. Only fittings supplied or recommended by the manufacturer shall be used. Where designated on the plans or project specifications, an elastomeric gasket meeting the requirements of ASTM F477 shall be supplied.

Installation of the pipe specified above shall be in accordance with either AASHTO 30 or ASTM D2321 and as recommended by the manufacturer, with the exception that minimum cover in traffic load areas shall be 12” for pipe diameters between 4” and 48” and 18” for pipe diameters 60” and greater.

## **2.04 CASTINGS**

Castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arises. Machined joints, where required, shall be milled to a close fit. Provide all necessary lugs and brackets so that work can be assembled in a neat, substantial manner.

## **2.05 AGGREGATE FOR UNDERDRAINS**

Aggregate for underdrains shall be washed stone, standard size number 67 per North Carolina Department of Transportation specifications, Section 905.

# **PART 3: EXECUTION**

## **3.01 PREPARATION OF PIPE FOUNDATION**

### **A. LINES AND GRADES**

The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustments will require the approval of the Engineer. When an Inspector is present on the site and is so requested by the Contractor, he shall check the position of grades and lines; but the Contractor shall be responsible for the finished drain line being laid to exact and proper line and grade.

## B. PIPE FOUNDATION

1. Whenever the nature of the ground will permit, the excavation at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe.
2. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". A suitably tamped and shaped foundation of suitable earth shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
3. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within the limits established on the plans, and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.

## C. WATER IN TRENCHES

The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing; and no pipes shall be laid until the water has been removed from the trench. The Contractor will not be permitted to drain water through the storm drain within a period of twenty-four (24) hours after the pipe has been laid, and the open end of the pipe in the trench shall be kept closed with a tight fitting plug to prevent washing of dirt or debris into the line. Water so removed from the trench must be disposed of in such manner as not to cause injury to work completed or in progress.

#### D. SPECIAL FOUNDATIONS

Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, a Geotechnical Materials Testing Engineer will be required to examine the materials and make recommendations for necessary repairs to subgrade.

### 3.02 **LAYING PIPE**

#### A. GENERAL

All piping is to be installed in strict accordance with the manufacturer's recommendations. Installation manuals from various material suppliers shall be furnished to the Engineer for his review and approval prior to installation of any material. The Engineer may augment any manufacturer's installation recommendations, if in his opinion it will best serve the interest of the Owner.

#### B. LAYING PIPE

1. No pipe shall be laid except in the presence of the Engineer or his inspector, or without special permission from the Engineer. Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be carefully given a final inspection to see that it is clean, sound and free of defects. It shall be laid on the prepared foundation to produce a straight line on a uniform grade, each pipe being laid as to form a close abutted joint with a preceding pipe, so as to form a smooth and straight inside flow line. Each pipe will be tested for its exact position after it is in its final position. The pipes shall be fitted together in order to insure sufficient space for joint gaskets, and other jointing material. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
2. When cutting short lengths of pipe, a pipe cutter as approved by the Engineer will be used, and care will be taken to make the cut at right angles to the center line of the pipe, or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder, or course file to match the manufactured taper.
3. When coupling bands for annular or helical corrugated metal pipe are used, the pipe sections shall be joined and fully bolted so that the circumferencial and longitudinal strength will be sufficient to preserve the

alignment, prevent separation of the sections, and to prevent infiltration of backfill material.

### **3.03 BACKFILLING**

- A. The backfill around the pipe shall be placed in layers not to exceed 6" loose and compacted to 95% Standard Proctor test for all areas and 98% for top 24" below subgrade directly beneath subgrade in paved areas. From the bottom of the trench to the centerline of the pipe the backfill material shall be compacted by approved hand tamps. From the centerline of the pipe to the top of the trench other mechanical tamps as approved by the Engineer may be used. The Engineer shall approve all backfill material. Select backfill material shall be used when called for on the plans.
- B. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, roots and limbs, chunks of highly plastic clay, or other objectionable materials.
- C. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
- D. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe, which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

### **3.04 TESTING**

- A. Upon completion, installed lines shall show a full circle of light when "Lamped" between catch basins. This test shall be performed by the Engineer.
- B. Other tests may be required by the Engineer, such as exfiltration and compaction of backfill over pipes. In this event the results shall meet the minimum standards that the manufacturer states are obtainable.
- C. One compaction test performed directly above storm pipe placed in areas under pavement shall be conducted every 300 LF of storm pipe placed and shall meet testing requirements noted in section 2220 of the specifications.

**END OF SECTION**

## **SECTION 33 49 00**

## **MINOR DRAINAGE STRUCTURES**

### **PART 1: GENERAL**

#### **1.01 SCOPE OF WORK**

The work covered by this section consists of the installation of drainage catch basins, together with all necessary metal grates, covers, frames, and other hardware, in accordance with the requirements shown on the plans and the provisions of these specifications.

#### **1.02 QUALITY ASSURANCE**

All plastic surface drainage structures and other fabricated materials shall be manufactured by suppliers with at least five (5) years of experience in the manufacture of similar materials.

#### **1.03 SUBMITTALS**

##### **SHOP DRAWINGS**

The Contractor shall submit at least six (6) copies of shop drawings to the Engineer, including dimensional drawings, materials of construction; catalogue cut sheets, and other pertinent information.

#### **1.04 DELIVERY, STORAGE AND HANDLING**

All materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations, and in a manner, which preserves the structural integrity of the materials.

#### **1.05 WARRANTY**

All materials and equipment shall be warranted to be free from defects in workmanship and materials for one (1) year after final acceptance.

### **PART 2: PRODUCTS**

#### **2.01 MATERIALS**

##### **A. Storm Inlet Structures**

1. Concrete and masonry shall meet the requirements of the appropriate section of NCDOT Standard Specifications for Roads and Structures (latest Edition). All concrete shall be Class A or B 4000 psi minimum unless otherwise indicated on the plans, meeting the requirements of Section 700 and constructed in accordance with Section 825. Masonry



shall meet the requirements of Section 700 and construction in accordance with Section 830 and/or 834.

2. Where necessary to fit field conditions, the dimensions of the structure and footings shall be varied as directed by the Engineer.
3. Plastic (PVC) surface drainage structures shall conform to the dimensions and depth referenced on the Construction drawings. The required ductile iron frame shall be provided from the manufacturer as an integral part of the surface drainage structure. All pipe junctions internal to the box shall be made by means of thermal molding and shall be water tight. Connections to stormwater conveyance pipe shall be water tight and shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main structure of the catch basin. The Ductile Iron frame and grate shall be manufactured in a way that allows them to rest securely on the rim of the Plastic catch basin and shall conform to ASTM A536 grade 70-50-05 for Ductile Iron.

#### B. FITTINGS AND CONNECTIONS

1. Where fittings enter the masonry, they shall be placed as the work is built up, thoroughly bonded, and accurately spaced and aligned.
2. Pipe connections shall be made using manufacturer provided bell and spigot type joints. Any sump that exists in the structure shall be filled with an approved material to ensure that there is no standing water in the surface drainage structure.
3. Metal frames for grates and covers shall be set elastomeric rings on the plastic surface drainage structure. The surrounding concrete shall be set at line and grade per the construction plans to allow proper drainage into the structure while allowing the top of the structure to be removed for maintenance if necessary.

#### C. BACKFILL

After the structure has been completed, and all forms, falsework, sheeting, and bracing have been removed, the excavation shall be backfilled with approved material compacted to a density of 95% standard proctor for areas unpaved and 98% for the last 24" under subgrade in paved areas. Backfilling shall not be done until the concrete or brick masonry has cured for at least seven (7) curing days, unless otherwise permitted by the Engineer. Please refer to the project grading specifications for allowable soil types and compaction procedures.

#### D. PIPE COLLARS AND PIPE PLUGS

Pipe collars and pipe plugs shall be constructed in accordance with the details shown on the plans or as directed by the Engineer.

### **PART 3: EXECUTION**

#### **3.01 INSTALLATION**

- A. Drainage structures shall be built to the lines, grades and dimensions as shown on the plans. The Contractor shall adjust the final grades in the field as necessary to provide positive drainage to the structures or to match final pavement or grade elevation.
- B. Excavations for drainage structures shall be made with care so as not to disturb the surrounding areas more than necessary. All excavations shall be maintained water free until completion of the drainage structure, including backfilling. The Contractor shall provide adequate pumping capacity as required.
- C. Place 6" of #57 washed stone under structures. Where the foundation material is found to be of poor supporting value, the existing foundation material shall be removed by undercutting to the depth directed by the Engineer and backfilled with suitable material secured from locations along the project or from a borrow pit. The backfill placed in the undercut area shall be compacted to a degree satisfactory to the Engineer.

#### **3.02 QUALITY CONTROL AND FIELD TESTING**

The Contractor shall demonstrate to the Owner and Engineer that all drainage structures operate as intended and designed. All drainage structures shall be field tested by the Contractor in the presence of the Engineer prior to final acceptance. All drainage structures will be cleaned of debris and sediment before being turned over to the Owner.

**END OF SECTION**