

# SITE DEVELOPMENT SPECIFICATIONS

## *Buck Island- Simmonsville Neighborhood Sidewalks, Phase 4*

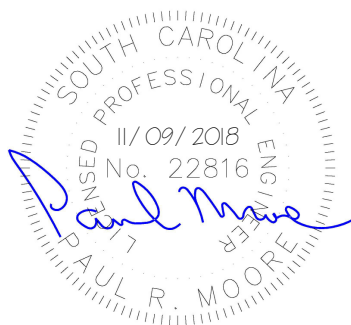
Prepared for Town of Bluffton

*Project No. 150608*

Project Location:  
Beaufort County, South Carolina



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## PART 1 GENERAL

### 1.1 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

### 1.2 APPLICATIONS FOR PAYMENT

- A. Submit four (4) copies of each application on form approved by the Engineer.
- B. Content and Format: Utilize “Schedule of Bid Prices” included as an attachment to the Agreement for listing items in Application for Payment.
- C. Payment Period: Monthly.

### 1.3 CHANGE PROCEDURES

- A. Authorized Changes to the Work: Pursuant to written direction to Contractor from the Engineer or the Owner in the form of a Change Order or Field Order.
- B. Change Order: Issued for changes in quantities of Work, Contract Price or Contract Time.
- C. Field Order: Issued for minor changes for which there is no change in Contract Price or Contract Time.
- D. Changes in Contract Price or Contract Time will be determined in accordance with Article 12 of the General Conditions.

### 1.4 UNIT PRICES

- A. Unit Price Schedule: The “Schedule of Bid Prices” is contained in the Bid Form, included as an attachment to the Agreement.
- B. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies and appurtenances; bonds, insurance, providing all construction plant, equipment and tools; transportation, testing and performing all necessary labor and supervision to fully complete the Work shall be included in the unit prices bid for each item.
- C. All work not specifically set forth as a pay item in the Schedule of Bid Prices in the Bid Form shall be considered a subsidiary obligation of the contractor and all costs in connection therewith shall be included in the prices bid.
- D. All items of Work shall be measured in the units indicated in the Schedule of Bid Prices.

## 1.5 COORDINATION

- A. Coordinate scheduling, submittals, and Work by subcontractors under the various sections of the specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

## 1.6 FIELD ENGINEERING

- A. Employ experienced instrument technician to locate reference datum and protect survey control and reference points.
- B. Establish elevations, lines, and levels and certify elevations and locations of the Work conform to Contract Documents.
- C. Verify field measurements are as indicated on shop drawings or as instructed by manufacturer.

## 1.7 PRECONSTRUCTION MEETINGS

- A. The requirements for preconstruction meetings are outlined in the General Conditions and the Supplementary Conditions.
- B. Engineer will coordinate preconstruction meetings with affected parties.
  - 1. Time and place: As determined by Owner or other affected agencies.
  - 2. Attendees: As specified in the General Conditions and in the Supplementary Conditions and as directed by the Owner or the Engineer.

## 1.8 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at intervals to be determined at the preconstruction meeting.
- B. Preside at meetings, record minutes, and distribute copies within three days to those affected by decisions made.

## 1.9 SUBMITTAL PROCEDURES

- A. Within 15 days after the date established in the Notice to Proceed, submit preliminary Schedule of Submittals in duplicate for Engineer's review. Include Product data, Shop Drawings, samples and certifications as required by Technical Specification Sections.
- B. Submit at least five copies of each submittal. The Engineer will retain four copies and return the remainder to the Contractor.
- C. Attach each submittal to a submittal form that identifies the Project, Contractor, subcontractor or supplier, and applicable Contract Document references.

- D. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of completed Work.
- F. Revise and resubmit submittals as required; identify changes made since previous submittal.

#### 1.10 CONSTRUCTION PROGRESS SCHEDULES

- A. Within 15 days after the date established in the Notice to Proceed, submit preliminary Progress Schedule in duplicate for Engineer's review. Revise and resubmit as required.
- B. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

#### 1.11 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions.
- C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

#### 1.12 REFERENCES

- A. Conform to referenced standards, specifications and details of construction by date of issue current as of date for receiving bids.
- B. When referenced standards, specifications or details of construction conflict with Contract Documents, request clarification from Engineer before proceeding.

#### 1.13 TESTING LABORATORY SERVICES

- A. All testing, including re-testing due to failure of acceptance tests, will be paid for by the Contractor.
- B. Contractor will appoint, employ, and pay for specified services of an independent testing laboratory, acceptable to the Owner, to perform all testing required by the Technical Specifications.

- C. Testing laboratory shall operate in accordance with ASTM C1077, ASTM D3740, ASTM D3666 and ASTM E329.
- D. Cooperate with independent firm; furnish samples as requested.
- E. Furnish five (5) copies of all test reports to Engineer.

#### 1.14 TEMPORARY UTILITIES

- A. Provide and pay for temporary electricity and power outlets for construction operations; connections, branch wiring, distribution boxes and flexible power cords as required.
- B. Provide and maintain temporary lighting for construction operations if required.
- C. Provide, maintain and pay for suitable quality water service required for construction operations.
- D. Provide and maintain required sanitary facilities and enclosures.
  - 1. Maintain in clean and sanitary condition.
  - 2. Strictly enforce their use.

#### 1.15 MAINTENANCE AND REMOVAL OF TEMPORARY FACILITIES

- A. Maintain temporary utilities and facilities as long as needed for safe and proper completion of Work.
- B. Remove temporary utilities, equipment, facilities, materials prior to Substantial Completion.
- C. Clean and repair damage caused by installation or use of temporary Work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

#### 1.16 PROGRESS CLEANING AND WASTE REMOVAL

- A. Collect and maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Deposit waste material, trash, construction debris in securely lidded metal containers and remove from site on a regular basis.
- C. Waste storage containers shall meet all local and state solid waste management regulations.
- D. Dispose of waste material and trash at a location offsite designated to receive such material.

- E. No waste material, trash or construction debris of any kind will be buried on the site.
- F. All hazardous waste shall be disposed of in accordance with state and local regulations and the manufacturer's recommendations.

#### 1.17 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification sections.

#### 1.18 WATER CONTROL

- A. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

#### 1.19 POLLUTION AND ENVIRONMENTAL CONTROL

- A. Implement the Storm Water Pollution Prevention Plan (SWPPP) upon commencement of construction activities and comply with all provisions of the SWPPP throughout the construction period.
- B. Periodic site inspections required by the SWPPP, along with all required inspection reports shall be provided by the Owner.

#### 1.20 PRODUCT DELIVERY, HANDLING, STORAGE

- A. Deliver, handle, store, and protect Products in accordance with manufacturer's instructions.
- B. Store only enough product on site to complete the Work under this project.
- C. Keep products stored in neat, orderly manner in appropriate containers and, where applicable, protected from the weather.
- D. Do not place materials on private property without written permission from property owner.
- E. During loading, transporting and unloading, exercise care to prevent damage to materials.
- F. Store products in their original containers with original manufacturer's labels and safety data.
- G. Follow manufacturer's instructions as well as all state and local regulations and recommendations for disposal of unused or waste product.
- H. Mix substances only in accordance with manufacturer's instructions.



- I. Contain spills and leakage and perform spill or leakage clean up immediately and in accordance with manufacturer's instructions as well as all state and local regulations and recommendations.

#### 1.21 SUBSTITUTIONS

- A. Engineer will consider requests for Substitutions only after the effective date of the Agreement.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. Submit five copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

#### 1.22 AS-BUILT DRAWINGS

- A. Water Distribution and Sanitary Sewer Systems.
  1. Maintain on site one set of Contract Drawings to be annotated for As-Built Drawings.
  2. Record in red on the As-built Drawings all deviations from the Contract Drawings, including, but not limited to, the following data for the water distribution and sanitary sewer systems:
    - a. Horizontal location:
      - 1) Underground pipelines
      - 2) Fittings
      - 3) Valves
      - 4) Fire hydrants
      - 5) Manholes
      - 6) Clean-outs
      - 7) Service laterals
      - 8) Service lateral terminations
      - 9) Pump stations
    - b. Depth of cover on all valves and fittings if greater than 3-ft.
    - c. Type, size, material, joint type and manufacturer of all valves
    - d. Linear feet of water line, sanitary sewer or force main
    - e. Size, type (material) and class of pipe
    - f. Slope of gravity sewer lines
    - g. Average bury depth of pipe
    - h. Identification of fittings type, material, size and joint type
    - i. Elevations at manholes: Rim and inverts
    - j. Elevation on top of force main connection to manhole or force main manifold
  3. Record in red on the As-Built drawings for water and sanitary sewer systems, the following data for locations at which the newly installed pipe lines cross existing pipe lines or culverts:
    - a. Horizontal location of point of crossing
    - b. Elevation of top and bottom of existing pipe line or culvert at point of crossing

- c. Elevation of top and bottom of newly installed pipe line at point of crossing
- d. Fittings used at crossing:
  - 1) Type, size, joint type
  - 2) Horizontal location
  - 3) Elevation of top of fittings
- 4. Location and dimensional data may be obtained by field measurements or by generally accepted survey methods.
  - a. Field measurements:
    - 1) All measurements shall be from permanent above-ground structures, monuments or other identifiable reference objects approved by the Engineer.
    - 2) The location of elements by field measurements shall be defined by measurements to at least two reference objects.
  - b. Location by survey methods:
    - 1) Survey must be based on the USA South Carolina State Plane, RNAD 83 Coordinate System (Map code SC83F).
    - 2) Elevations must be based on the 1929 USGS datum.
    - 3) Furnish data as Point Files in AutoCAD or ASCII format.

**B. Storm Drainage System:**

- 1. The Owner shall engage the services of a registered South Carolina Professional Land Surveyor to conduct a field survey of the completed storm drainage facilities and to prepare as-built drawings for the storm drainage system. The following data shall be obtained by the Surveyor and included in the as-built drawings for the storm drainage system:
  - a. Horizontal location of pipe ends, drainage inlets, catch basins, junction boxes, manholes, headwalls and pond inlet/outlet structures
  - b. Elevation of frame, grate or lid, throat, and sump (bottom) at all drainage inlets, catch basins manholes and junction boxes
  - c. Invert elevation of all pipe ends
  - d. Identification of pipe diameter and material
  - e. Identification of inlet or catch basin type.
  - f. Size and type of manhole or junction box.
  - g. Elevations at storm water pond:
    - 1) Top of bank elevation
    - 2) Bottom elevation
    - 3) Top of embankment/berm elevation
    - 4) Littoral shelf elevation (if applicable)
    - 5) Invert elevation of pond emergency spillway (if applicable)
    - 6) Weir/invert elevation(s) and dimensions of pond outlet control structure(s)
- 2. Data appearing on the as-built drawing for the storm drainage system shall be obtained by accepted field survey methods.
  - a. Horizontal information shall be based on NAD 83.
  - b. Vertical information shall be based on NGVD 29.

3. The as-built drawings for the storm drainage system shall be signed and sealed by the SC PLS who prepared them.
- C. In the event deviations are made from approved shop drawings, a copy of the shop drawings, annotated in red showing the changes and as-built data, shall be included as part of the As-Built Drawings.

#### 1.23 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Deliver the following documents to the Engineer:
1. As-built drawings
  2. Executed Contractor's General Guarantee
  3. Executed Certificate of Non-Litigation
- C. Submit final Application for Payment identifying total adjusted Contract Sum/Price, previous payments, and amount remaining due.

#### 1.24 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean debris from drainage systems.
- C. Remove waste and surplus materials, rubbish and construction facilities from site.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

Not Used.

END OF SECTION

## SECTION 02140

### DEWATERING

#### PART 1 GENERAL

- 1.1 DESCRIPTION: This section specifies performance of dewatering required to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in the dry. Control of surface water shall be considered as part of the work under this specification.
- 1.2 REQUIREMENT:
- A. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain ground water table to an elevation at least 1 foot below lowest foundation subgrade or bottom of pipe trench and to allow material to be excavated in a reasonably dry condition. Materials removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill work has been completed.
  - B. Reduce hydrostatic head below any excavation to extent that water level in the construction area is a minimum of 1 foot below prevailing excavation surface.
  - C. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
  - D. Maintain stability of sides and bottom of excavation.
  - E. Construction operations are performed in the dry.
  - F. Control of surface and subsurface water are part of dewatering requirements. Maintain adequate control so that the stability of excavated and constructed slopes are not adversely affected by saturated soil including water entering prepared subbase and subgrades where underlying materials are not free draining or are subject to swelling or freeze-thaw action , that erosion is controlled and that flooding of excavations or damage to structures does not occur. Drain surface water away from excavations. Protect excavations from becoming wet from surface water, or insure excavations are dry before additional work is undertaken.

### 1.3 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01001, General Requirements, Article 1.13 Testing Laboratory Services.
- B. Safety Requirements: General Conditions, Article 6.13 Safety and Protection.
- C. Subsurface Investigation: General Conditions, Article 4.02 Subsurface and Physical Conditions

### 1.4 SUBMITTALS:

- A. Submit in accordance with Section 01001 General Requirements, Article 1.9 Submittal Procedures.
- B. Submittals should be made to allow time for review and comment prior to scheduled time for commencement of trenching operations.
- C. Drawings and Design Data:
  - 1. Submit drawings and data showing the method to be employed in dewatering excavated areas.
  - 2. Submitted material shall include location, depth and size of well points, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal.
  - 3. Materials submitted shall be in a format acceptable for inclusion in required permit applications to any and all regulatory agencies for which permits for discharging water from the dewatering system are required due to the discharge reaching regulated bodies of water.

## PART 2 PRODUCTS (Not used)

## PART 3 EXECUTION

### 3.1 INSTALLATION:

- A. Install a dewatering system to lower and control ground water in order to permit excavation, construction of structure and placement of backfill materials, to be performed under dry conditions. Make the dewatering system adequate to pre-drain the water-bearing strata above and below the bottom of structure foundations, utilities and other excavations.
- B. In addition, reduce hydrostatic pressure head in water-bearing strata below structure foundations, utility lines, and other excavations, to extent that water

levels in construction area are a minimum of 1 foot below prevailing excavation surface at all times.

3.2 OPERATION:

- A. Prior to any excavation below the ground water table, place system into operation to lower water table as required and then operate it continuously 24 hours a day, 7 days a week until all utilities and structures have been satisfactorily constructed including placement of backfill materials and dewatering is no longer required.
- B. Place an adequate weight of backfill material to prevent buoyancy prior to discontinuing operation of the system.

3.3 WATER DISPOSAL: Dispose of water removed from the excavations in such a manner as to not endanger portions of work under construction or completed. Dispose of water in such a manner as will cause no inconvenience to others working near site. Comply with the stipulations of required permits for disposal of water.

3.4 STANDBY EQUIPMENT: Provide complete standby equipment, installed and available, for immediate operation as may be required, to adequately maintain dewatering on a continuous basis and, in the event that all or any part of the system may become inadequate or fail.

3.5 CORRECTIVE ACTION: If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), perform work necessary for reinstatement of foundation soil resulting from such inadequacy or failure by contractor, at no additional cost to Owner.

3.6 REMOVAL: Insure compliance with all conditions of regulating permits and provide such information to the Engineer. Obtain written approval from Engineer before discontinuing operation of dewatering system.

END OF SECTION

## SECTION 02230

### SITE CLEARING AND MINOR DEMOLITION

#### PART 1 GENERAL:

##### 1.1 SUMMARY:

- A. This Section includes the following:
  - 1. Protection of existing trees that are to remain.
  - 2. Removal of designated trees and other vegetation.
  - 3. Clearing and grubbing.
  - 4. Removal of drainage and utility pipes and structures.
  - 5. Abandoning existing pipes and structures in place.
  - 6. Removal of designated paving, curbs, gutters and sidewalks
  - 7. Removal of debris and all unusable material from the site
  
- B. Related Documents:
  - 1. Section 02221 – Building Demolition
  - 2. Section 02300 – Earthwork
  - 3. Section 02374 – Erosion Control

##### 1.2 MEASUREMENT AND PAYMENT

- A. Tree Protection
  - 1. Basis of Measurement: Linear feet of tree protection installed in accordance with the details on the drawings and as specified herein.
  - 2. Basis of Payment: Payment will be made at the unit price bid per linear foot for Tree Protection and will include all costs for material, labor, equipment, transportation, installation, maintenance in place, removal and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Tree Protection
  
- B. Clearing and Grubbing
  - 1. Basis of Measurement: Work under this Section will be measured by the number of acres of cleared and grubbed area. No separate measurement will be made for tree removal.
  - 2. Basis of Payment: Payment will be made at the unit price bid per acre for Clearing and Grubbing and shall include all costs for clearing, grubbing, tree removal, removal of all debris and waste material from the site and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Clearing and Grubbing

- C. Pavement Removal;
  - 1. Basis of Measurement: Square yards of asphalt or portland cement concrete pavement removed as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per square yard for Pavement Removal and shall include all costs for saw cutting, breaking, removal, loading and unloading, hauling, disposal off site and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Pavement Removal
  
- D. Concrete Curb and Gutter Removal:
  - 1. Basis of Measurement: Linear feet of concrete curb, concrete gutter or concrete combination curb and gutter removed as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per linear foot for Concrete Curb/Gutter Removal and shall include all costs for saw cutting, breaking, removal, loading and unloading, hauling, disposal off site and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Concrete Curb/Gutter Removal
  
- E. Sidewalk Removal:
  - 1. Basis of Measurement: Square yards of portland cement concrete or asphalt sidewalk removed as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per square yard for Sidewalk Removal and shall include all costs for saw cutting, breaking, removal, loading and unloading, hauling, disposal off site and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Sidewalk Removal
  
- F. Pipe Removal:
  - 1. Basis of Measurement: Linear feet of pipe removed as designated on the Drawings and in accordance with this section of the Specifications. No measurement will be made for pipe removed and replaced with new pipe in the same location.
  - 2. Basis of Payment: Payment will be made at the unit price bid per linear foot for Pipe Removal and shall include all costs for locating, excavation, backfilling, disconnecting, disposal and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings. No payment will be made for removal of pipe that is replaced with new pipe in the same location. Removal of the existing pipe will be considered incidental to the installation of the new pipe.
  - 3. Pay Item:



- a. Pipe Removal
- G. Plug and Abandon Pipe In Place:
- 1. Basis of Measurement: Each location where existing pipe is plugged and abandoned as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per each for plugging and abandoning pipe in place and shall include all costs for locating, excavation, backfilling, disconnecting, installing plug and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Plug and Abandon Pipe In Place
- H. Remove Existing Drainage Structure:
- 1. Basis of Measurement: Each existing drainage structure removed as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per each for removal of existing drainage structure, type indicated, and shall include all costs for excavation, backfill, demolition, removal, disposal off site, restoration and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Remove Existing Drainage Structure, (type indicated).
- I. Remove Existing Sanitary Sewer Manhole:
- 1. Basis of Measurement: Each existing sanitary sewer manhole removed as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per each for removal of existing sanitary sewer manhole and shall include all costs for excavation, backfill, demolition, removal, disposal off site restoration and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Remove Existing Sanitary Sewer Manhole
- J. Fill and Abandon Existing Manhole/Inlet:
- 1. Basis of Measurement: Each existing manhole or storm inlet filled and abandoned as designated on the Drawings and in accordance with this section of the Specifications.
  - 2. Basis of Payment: Payment will be made at the unit price bid per each for filling and abandoning existing manhole/inlet and shall include all costs for excavation, backfill, removal of castings, fill material, restoration and all other costs of whatever nature required to complete the Work as described herein and as shown on the drawings.
  - 3. Pay Item:
    - a. Fill and Abandon Existing Manhole/Inlet

## PART 2 PRODUCTS

2.1 Flowable Fill: SCDOT Standard Specifications, Section 210.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct, walks or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
  - 1. Protect improvements on adjoining properties and on Owner's property;
  - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- C. Tree Protection
  - 1. Protect existing trees and other vegetation indicated to remain in place to prevent damage resulting from unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line or any other acts which may be harmful to the continued growth of the trees to be protected.
  - 2. Install tree protection fencing where indicated on the plans and in accordance with the details on the Drawings. Maintain tree protection during length of construction activities. Remove tree protection only after all construction operations are complete and only when permitted by the Engineer.
  - 3. Comply with local tree ordinances.
  - 4. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
  - 5. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible or cut off cleanly below grade.
  - 6. Repair or replace trees and vegetation indicated to remain, which are damaged by operations, in a manner acceptable to Engineer. Employ a licensed arborist to repair damages to trees and shrubs. All tree repair work shall be done in accordance with the most recent revision of the International Society of Arboriculture practices.

7. Replace trees which, in the opinion of the arborist cannot be repaired and restored to full-growth.
8. Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

### 3.2 SITE CLEARING

- A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions required to permit installation of new construction. Remove similar items elsewhere on premises as specifically indicated. "Removal" includes digging out and off-site disposing of stumps and roots.
  1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
- B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.
  1. Completely remove stumps, roots, and other debris protruding through ground surface;
  2. Use only hand methods for grubbing inside drip line of trees indicated to remain;
  3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated;
    - a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.
- C. Open burning on the site shall only be allowed if authorized in writing by Owner. Burning must comply with all state Air Pollution Regulations with regard to open burning as well as all local ordinances and regulations. Any permits required by state and local agencies for open burning shall be obtained by the Contractor.
- D. Remove all debris and waste material from Owner's property.

### 3.3 MINOR DEMOLITION AND ABANDONMENT

- A. Pavement Removal
  1. Neatly saw cut pavement, including curb, gutter and sidewalk, at right angle to surface. Use of power driven impact tools for cutting pavement at juncture with pavement to remain is not allowed.
  2. Remove pavement to the limits indicated on the Drawings.
- B. Pipe Removal

1. Remove pipe at the locations and to the limits indicated on the Drawings.
  2. Dispose of all removed pipe off the site of the Work.
  3. Backfill in accordance with Section 02324 – Trenching, Backfilling For Utilities
- C. Removal of Drainage and Utility Structures
1. When directed by the Owner or the Engineer, remove and salvage castings to Owner at location directed.
  2. Remove complete structure, including base and foundation, at locations indicated on the Drawings.
  3. Dispose of all removed and unsalvaged material off site.
  4. Backfill with suitable material.
- D. Abandoning Pipes In Place
1. Existing pipes to be abandoned in place are indicated on the Drawings.
  2. Install plug in accordance with the details shown on the Drawings at locations indicated.
  3. Where specifically called for on the Drawings, fill abandoned pipes with flowable fill for their entire length.
- E. Abandoning Minor Structures In Place
1. Where indicated on the Drawings manholes, inlets, vaults and other minor below ground structures will be abandoned in place.
  2. Remove top castings that are not cast into top slab.
  3. Remove top slab.
  4. Remove top portion of walls to a depth of 2-feet below finished grade.
  5. Plug all pipes entering and leaving structure.
  6. Fill structure to 2-feet below finished grade with a well graded granular material. Material may contain stones up to 6-inches in diameter provided there are adequate fines to completely fill all voids.
  7. Backfill to finished grade with suitable material, including topsoil where appropriate, and restore to match surrounding area.

END OF SECTION

## SECTION 02300

### EARTHWORK

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Preparation of subgrade for building slabs, walks, and pavements;
  - 2. Performing all grading, excavation, filling and compaction operations;
  - 3. Remove and replace topsoil;
  - 4. Finish grading, including shoulders and banks.
  
- B. Excavation and backfilling of trenches for water, sewer, storm drains and other utility lines is not included in this section but may be found in Section 02324, Trenching, Backfilling For Utilities.
  
- C. Related Sections:
  - 1. Section 02221 – Building Demolition
  - 2. Section 02230 – Site Clearing And Minor Demolition
  - 3. Section 02324 – Trenching, Backfilling For Utilities
  - 4. Section 02374 – Erosion Control
  - 5. Section 02720 – Aggregate Base Course
  - 6. Section 02740 – Hot Mixed Asphalt Pavement
  - 7. Section 02750 – Portland Cement Concrete Pavement

##### 1.2 MEASUREMENT AND PAYMENT

- A. Excavation and Fill
  - 1. Basis of Measurement: Suitable earth material excavated on site and placed in fill on site will be measured by the cubic yard, in its original location.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for excavation and placing earth material as on-site fill and shall include all costs for excavating, stockpiling, loading, unloading, hauling, placing, compacting, moisture control, testing, disposal of unsuitable and excess material and all other costs of whatever nature required for the performance of the Work under this Section of the Specifications.
  - 3. Pay Item:
    - a. Excavation and Fill
  
- B. Excavation and Disposal
  - 1. Basis of Measurement: Unsuitable excavated earth material disposed of off the site will be measured by the cubic yard, in its original location.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for excavation and disposal off-site of unsuitable excavated earth material and shall include all costs for excavating, stockpiling, loading, hauling,

unloading and all other costs of whatever nature required for the performance of the Work under this Section of the Specifications.

3. Pay Item:
  - a. Excavation and Disposal

C. Borrow

1. Basis of Measurement: Suitable earth material from off site borrow sources placed in fill on site will be measured by the cubic yard, in place.
2. Basis of Payment: Payment will be made at the Unit Price bid for borrow material and shall include all costs for excavating, stockpiling, loading, hauling, unloading, placing, compacting, moisture control, testing, disposal of unsuitable and excess material and all other costs of whatever nature required for the performance of the Work under this Section of the Specifications.
3. Pay Item:
  - a. Borrow

D. Stripping Topsoil

1. Basis of Measurement: Suitable topsoil stripped and placed in stockpile will be measured by the cubic yard, in its original location.
2. Basis of Payment: Payment will be made at the Unit Price bid for stripping topsoil and shall include all costs for excavating, loading, hauling, unloading, stockpiling, disposal of unsuitable material and all other costs of whatever nature required for the performance of the Work under this Section of the Specifications.
3. Pay Item:
  - a. Stripping Topsoil

E. Finish Grading

1. Basis of Measurement: The areas that are finish graded as specified herein and as shown on the drawings, including areas receiving topsoil, will be measured by the square yard.
2. Basis of Payment: Payment will be made at the Unit Price bid for finish grading and shall include all costs for material, labor, loading, hauling, placing topsoil, grading, clean up, disposal and all other costs of whatever nature required for the performance of the Work under this Section of the Specifications.
3. Pay Item:
  - a. Finish Grading

### 1.3 REFERENCES

A. American Society of Testing and Materials (ASTM):

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

#### 1.4 DEFINITIONS

- A. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular base course, subbase course, drainage fill, structure foundations or topsoil materials.
- B. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

#### 1.5 SUBMITTALS

- A. Section 01001- General Requirements: Submittal Procedures:.
- B. Samples: Furnish samples of fill material to testing laboratory.
- C. Materials Source: Furnish information to Engineer identifying source for all fill materials. Include location of borrow areas.
- D. Test Reports:
  1. Laboratory test reports for all materials proposed for use in embankments or backfill.
    - a. sieve analysis
    - b. moisture/density curves
    - c. optimum moisture analysis
  2. Field test reports:
    - a. In-place density tests
    - b. Moisture content

### PART 2 PRODUCTS

#### 2.1 SOILS

- A. Satisfactory soil materials are defined as those complying with ASTM D2487-00 soil classification groups GW, GP, GM, SM, SW, and SP. Soils classified as SM-SP with not more than 15% passing the #200 sieve may be considered acceptable.

- B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT. Clays, silts and organic soils will be considered unsatisfactory.

## PART 3 EXECUTION

### 3.1 EXCAVATION

- A. Excavate topsoil to the depths indicated on the plans and place in stockpile on site.
- B. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
- C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations shown on the Drawings or directed by the Engineer.
  - 1. Material removed by unauthorized excavation shall be replaced with suitable material.
  - 2. No payment will be made for unauthorized excavation or the replacement of material removed by unauthorized excavation.
- D. Satisfactory excavated material may be transported directly to and placed in fill areas within the limits of the work, subject to the requirements for moisture control as specified in subsequent sections of this specification. Stockpiling of satisfactory excavated material for later placement in fill areas on the site may be permitted subject to approval by the Engineer. No additional payment will be made for moving satisfactory material into or out of stockpiles. No satisfactory material shall be removed from the site without the express permission of the Owner.
- D. Unsatisfactory material shall be transported directly off-site to a suitable disposal area.
- E. Additional Excavation:
  - 1. Unsatisfactory material encountered at subgrade in areas to be paved shall be excavated to a minimum of 2 feet below finished subgrade and replaced with satisfactory material from on-site or borrow excavations.
  - 2. When excavation has reached required subgrade elevations, notify Engineer, who will make an inspection of conditions. If Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer.
- F. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.



### 3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
- B. 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 excavations.
- C. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

### 3.3 STORAGE OF EXCAVATED MATERIALS

- A. When the Contractor's operations necessitate stockpiling acceptable excavated materials for later placement in fills, locate stockpiles at a location acceptable to Owner. Grade, and shape stockpiles for proper drainage.
- B. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

### 3.4 PLACEMENT

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- B. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- C. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

- E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification. Correct improperly compacted areas or lifts as directed by Engineer.

### 3.5 COMPACTION

- A. Moisture Control:
  - 1. Moisture tempering of the soils used for embankment/fills/backfill shall be the responsibility of the Contractor. No additional payment will be made for moisture tempering of soils.
  - 2. Embankment/fill material shall be within +/- 4 percent of optimum moisture content before rolling to obtain the prescribed compaction. In order to achieve uniform moisture content throughout the layer, wetting or drying of the material and manipulation shall be required when necessary.
  - 3. The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content in order to achieve the correct density.
- B. Compaction Requirements: Compact soil to not less than the following percentages of maximum density as determined in accordance with ASTM D1557 (modified effort) in the areas indicated:
  - 1. Under structures, building slabs and steps, curbs/gutters, and pavements, compact top 24 inches of subgrade to 98 percent of maximum density. Compact soils below the top 24 inches to a density of 95 percent of maximum density.
  - 2. Under lawn or unpaved areas (lagoon banks), compact top 12 inches of subgrade in cut areas and each layer of backfill or fill material to 90 percent maximum density;
  - 3. Under walkways, compact top 12 inches of subgrade to 98 percent maximum density. Layers below the top 12 inches may be compacted to 95 percent maximum density;

### 3.6 FINISH GRADING

- A. General: Finish grading includes the placing of topsoil in areas outside the building lines or paved areas as indicated on the drawings.
- B. Uniformly grade areas within limits of grading, including adjacent transition areas and any areas disturbed by Contractor's operations. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- C. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
  - 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations;

2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation;
  3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.
- E. Topsoil Placement:
1. Place topsoil on all finish graded areas outside building lines and outside of paved or other surfaced areas
  2. Loosen subgrade to a minimum depth of 4 inches. Remove stones measuring over 1 1/2 inches in any dimension. Remove sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted after preparation.
  3. Spread top soil to minimum depth of 4" or as indicated on the plans over all disturbed areas and lightly roll.

### 3.7 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
1. Perform field density tests in accordance with ASTM D1556 or ASTM D2922.
  2. Building Pads: Perform at least two field density tests for every 2,000 square feet (SF) or portion thereof for each layer placed and for finished subgrade.
  3. Streets and roadways: Perform at least one field density test for every 200 linear feet, alternating lanes, for each layer placed and for finished subgrade.
  4. Parking fields: Perform at least one field density test for every 4800 square feet , or portion thereof, for each layer placed and for finished subgrade.
  5. Curb and Gutter: Perform at least one field density tests for every 300 linear feet (LF) or portion thereof for each layer placed and for finished subgrade.
  6. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

### 3.8 PROTECTION AND MAINTENANCE OF FINISHED WORK

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.9 DISPOSAL OF WASTE MATERIAL

- A. Remove waste materials, including unsatisfactory excavated material, trash, and debris, and dispose of it off Owner's property.

END OF SECTION

## SECTION 02324

### TRENCHING, BACKFILLING FOR UTILITIES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating trenches for water, sanitary sewer, storm drains and other utilities.
  - 2. Backfilling and compaction in utility trenches.
- B. Work under this section includes backfill above the pipe embedment zone (top of initial backfill). Pipe bedding and initial backfill are specified in other sections of the Technical Specifications for each type of pipe and utility.
- C. Related Sections.
  - 1. Section 02514 – Water Distribution System
  - 2. Section 02536 – Sanitary Sewer Force Mains
  - 3. Section 02537 – Gravity Sanitary Sewer
  - 4. Section 02630 – Storm Drainage
  - 5. Section 02661 – Reuse Irrigation Water Distribution System

##### 1.2 MEASUREMENT AND PAYMENT

- A. Trench Excavation:
  - 1. Basis of Measurement: No measurement will be made for trench excavation.
  - 2. Basis of Payment: No separate payment will be made for trench excavation. The cost of this Work shall be included in the unit price bid for the pipe line.
- B. Trench Backfill:
  - 1. Basis of Measurement: No measurement will be made for trench backfill.
  - 2. Basis of Payment: No separate payment will be made for trench backfill. The cost of this Work shall be included in the unit price bid for the pipe line.
- C. Imported Select Trench Backfill Material:
  - 1. Basis of Measurement: Cubic yards of select earth material imported from off-site borrow sources for use as trench backfill when approved by the Engineer.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for furnishing imported select trench backfill material and shall include all costs for excavating, loading, hauling, unloading, disposal of excess

material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.

3. Pay Item:
  - a. Imported Select Trench Backfill Material

D. Flowable Fill:

1. Basis of Measurement: Cubic yards of flowable fill placed as trench backfill.
2. Basis of Payment: Payment will be made at the Unit Price bid for flowable fill and shall include all costs for flowable fill material, loading, unloading, hauling, placing, disposal of excess material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Item:
  - a. Flowable Fill

E. Foundation Stabilization:

1. Basis of Measurement: Cubic yards of angular stone material placed as foundation stabilization below the pipe bedding when approved by the Engineer.
2. Basis of Payment: Payment will be made at the Unit Price bid for foundation stabilization and shall include all costs for stone, hauling, placing and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Item:
  - a. Foundation Stabilization

### 1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
  1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
  4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
  6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. SCDOT Standard Specifications for Highway Construction.

#### 1.4 SUBMITTALS

A. Section 01001 - Submittal Procedures

B. Materials Source: Submit information identifying source and location of imported backfill material.

C. Certification: Certify Products and materials meet or exceed specified requirements.

#### 1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

### PART 2 PRODUCTS

#### 2.1 BACKFILL AND FOUNDATION MATERIALS

A. Select Backfill:

1. Soil material free from organic matter and deleterious substances, containing no rocks or lumps over 2 inches in greatest dimension.
2. Acceptable material: Soil material complying with ASTM D2487 soil classification groups GW, GP, GM, GC, SC, SM, SW, and SP.
3. Unacceptable soil materials are those complying with ASTM D2487 soil classification groups, ML, MH, CL, CH, OL, OH, and PT. Silts and organic soils will be considered unacceptable.
4. Select backfill material shall be obtained first from acceptable material excavated from the trench, second from acceptable material excavated elsewhere within the construction site and last from off-site borrow sources when approved by the Engineer.

B. Flowable Fill: SCDOT Standard Specifications for Highway Construction, Section 210.

C. Foundation Stabilization Material: Processed, graded aggregate; SCDOT #57 stone, SCDOT Standard Specifications for Highway Construction.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.
- B. Notification Of Intent To Excavate:
  - 1. Comply with South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978). Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.
- C. Approximate location of certain underground lines and structures are shown on the plans for information only and additional underground lines or structures may exist that are not shown.
  - 1. Call Palmetto Utility Protection Service at 1-888-721-7877 between the hours of 7:00 AM and 7:00 PM Monday thru Friday at least three working days before commencing construction. Request underground utilities to be located and marked within and surrounding construction areas.
- D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect existing above and below grade utilities indicated to remain.
  - 1. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
  - 2. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
  - 3. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- F. Protecting Trees, Shrubbery and Lawns:
  - 1. Trees and shrubbery in developed areas and along the trench line shall not be disturbed unless absolutely necessary, and subject to the approval of the Engineer.
- G. Removing and Resetting Fences:
  - 1. Where existing fences must be removed to permit construction of utilities; remove such fences and, as the Work progresses, reset the fences in their original location and condition.
  - 2. Provide temporary fencing when required for animal control or as required by Owner.
- H. Restoration Of Disturbed Areas:
  - 1. Restore all areas disturbed by, during or as a result of construction activities to their existing or better condition.



- 2. This requirement does not include replacement of trees and undergrowth in undeveloped sections of the rights-of-way.
  - I. Initiate and maintain protective measures to minimize silting and bank erosion of creeks and rivers adjacent to the work.
  - J. Work located within streets or highways:
    - 1. Comply with SC Department of Highways and Public Transportation "Encroachment Permit" issued for the Work;
  - K. Keep at least one lane open to traffic at all times where utility pipeline is in or alongside the traveled street or highway. Where pipelines cross the street of highway, excavate only half the street or highway, install the pipe and backfill before excavating the other half of the street.
  - L. Maintain access to properties adjacent to the construction at all times.
  - M. Protection Of Persons and Property:
    - 1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
    - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
    - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.
    - 4. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- 3.2 Dewatering:
- A. Keep trenches and site construction area free from water.
  - B. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
- 3.3 CUTTING EXISTING PAVEMENT
- A. Use concrete saw for cutting concrete pavement.
  - B. Cut pavement to a neat straight line.
  - C. Pavement cut to extend 12-inches beyond top edge of excavation.
- 3.4 TRENCHING
- A. Excavation for trenches is unclassified and includes all material of whatever substance encountered.

- B. Perform excavation near existing utility services in accordance with utility's requirements.
- C. Do not advance open trench more than 200 feet ahead of installed pipe.
- D. Trench Width: Measured at the top of the pipe, adequate width to place and compact bedding material around pipe and for shoring. (See, also, other sections of these specifications.)
- E. Excavate bottom portion of trench with vertical or near vertical (within 10°) side walls to a point one foot above top of pipe.
- F. Excavation beyond the depths indicated on the plans or specified in other sections of these specifications in soils that are stable and that provide acceptable support for the pipes and embedment material will be considered unauthorized excavation. Unauthorized excavation shall be replaced with select material compacted to the densities specified for trench backfill. Angular stone material may be used for replacement of over excavated areas. Angular stone, when used, shall be completely wrapped in filter fabric to prevent the migration of fine grained soils from adjacent portions of the trench. No additional payment will be made for replacement of unauthorized excavation.
- G. Provide uniform and continuous bearing and support for bedding material and pipe.
  - 1. Rock: Rock or unyielding material shall be removed to a depth of at least 6 inches below the bottom of the pipe. (See other sections of these Specifications for specific utility lines.)
  - 2. Unstable foundation: When unstable soils are encountered, excavation shall be continued to a depth to be determined by soil conditions or as directed by the Engineer. Foundation stabilization material shall be placed as specified in other sections of these specifications. (See other sections of these Specifications for specific utility lines.)
- H. Excess and unacceptable excavated material not used in trench backfill shall be removed and used in other areas of the project, if applicable, or removed from the project site. No acceptable trench backfill material shall be removed from trench-side until the trench has been completely backfilled and compacted.

### 3.5 TRENCH PROTECTIVE SYSTEMS

- A. Provide trench protective system in compliance with OSHA Standards, 29 CFR - 1926 Subpart P.
- B. Sheet piling and shoring shall be removed during the backfilling process in accordance with the requirements in 29 CFR – 1926 Subpart P unless specifically noted on the plans to be left in place.
- C. Maintain the integrity of the trench protective system until its removal from the trench or until completion of backfilling in the case of shoring left in place.

- D. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate trench protective system.

3.6 BACKFILLING

- A. Backfill trenches to contours and elevations indicated on the drawings with unfrozen fill materials.
- B. Employ placement method that does not disturb or damage pipe or pipe coating.
- C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- D. Place backfill material in continuous layers, 6-inches compacted depth, and compact as follows:

Location	Compaction Per Cent Maximum Dry density (ASTM D1557, Modified Effort)
Top 24-inches beneath paved areas, curb and gutter, sidewalks, building slabs & within 10-ft. of buildings	98
Area below the top 24-inches beneath paved areas, curb and gutter, sidewalks, building slabs & within 10-ft. of buildings	95

- E. Moisture Control:
  - 1. Backfill soils shall be within +/- 4 percent of optimum moisture content before being placed in the trench and compacted to the prescribed density.
  - 2. In order to achieve uniform moisture content throughout the layer, wetting or drying of the material, shall be required when necessary. Moisture tempering may require spreading and manipulation of the soil excavated from the trench to accomplish the necessary wetting or drying. Moisture tempering of the soils used for backfill, either by drying or wetting, shall be the responsibility of the Contractor. No additional payment will be made for moisture tempering of soils.
  - 3. The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content in order to achieve the correct density.
- F. For trenches under existing pavement, place pavement base course material at the time the trench is backfilled. Type and thickness of base course material is shown on the drawings.

### 3.7 FIELD QUALITY CONTROL

- A. Section 01001 – General Requirements: Testing and Inspection Laboratory Services
- B. Perform laboratory material tests in accordance with ASTM D1557.
- C. Perform in place compaction tests in accordance with the following:
  - 1. Density Tests: ASTM D2922.
  - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- E. Frequency of Tests:
  - 1. Under pavement, curb, sidewalk, lawns, building slabs, within 10 feet of building: Each 200 linear feet or fraction thereof for each 6-feet of depth above top of pipe or fraction thereof.
  - 2. All other areas: Each 500 linear feet or fraction thereof for each 6-feet of depth above top of pipe or fraction thereof.

### 3.8 PROTECTION OF FINISHED WORK

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

END OF SECTION

SECTION 02374  
EROSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Silt fence, hay bales, filter fabric, stone rip-rap, gravel
- B. Related Sections:
  - 1. Section 02230 – Site Clearing and Minor Demolition
  - 2. Section 02300 – Earthwork
  - 3. Section 02514 – Water System
  - 4. Section 02537 – Sanitary Sewer system
  - 5. Section 02924 – Seeding and Mulching

1.2 MEASUREMENT AND PAYMENT

- A. Silt Fence Sediment Barrier:
  - 1. Basis of Measurement: Linear feet of silt fence, complete, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for silt fence and shall include all costs for furnishing, installing, maintaining, removal and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Silt Fence
- B. Straw Bale Sediment Barrier:
  - 1. Basis of Measurement; Each straw bale placed as sediment barrier at locations indicated on the plans.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each straw bale placed as sediment barrier and shall include all costs for furnishing, installing, maintaining, removal and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Straw Bales
- C. Inlet Protection:
  - 1. Basis of Measurement: Each installation of inlet protection, regardless of type, installed as prescribed herein and as shown on the drawings, complete, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for inlet protection and shall include all costs for furnishing, installing, maintaining, removal and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Inlet Protection

- D. Rip-Rap:
  - 1. Basis of Measurement: Square yards of rip-rap, including filter fabric, placed at the locations and to the thickness shown on the drawings, complete, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for rip-rap and shall include all costs for stone, hauling, filter fabric, placing and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Rip-Rap, Class \_\_\_\_\_
  
- E. Site Entrance/Exit:
  - 1. Basis of Measurement: Each site entrance/exit constructed as shown on the drawings and specified herein, complete, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for site entrance/exit and shall include all costs for all material, construction, maintaining, removal and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Site Entrance/Exit

### 1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM):
  - 1. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction
  
- B. South Carolina Department of Transportation Standard Specifications For Highway Construction

### 1.4 SUBMITTALS

- A. Section 01001 - Submittal Procedures: Requirements for submittals.
  
- B. Product Data: Submit manufacturer's technical product data and installation instructions for soil erosion control materials and products.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of soil erosion control systems products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
  
- B. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with soil erosion control similar to that required for project.
  
- C. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

## PART 2 PRODUCTS

- 2.1 Grass seed, fertilizer, mulch: As specified in Section 02924
- 2.2 Hay Bales: Standard size, densely baled straw or hay, wrapped with synthetic or wire bands (two minimum per bale).
- 2.3 Stone Rip-Rap: Class B, South Carolina Department of Transportation Standard Specifications For Highway Construction, Section 804.02
- 2.4 Gravel: Stone size in accordance with ASTM D 448 size No. 1 (1.5 inch to 3.5 inch diameter).
- 2.5 Filter Fabric Under Rip-Rap: Comply with Section 804.11 of South Carolina Department of Transportation Standard Specifications For Highway Construction
- 2.6 Silt Fence:
  - A. Posts: Steel
  - B. Fabric: Comply with Section 815.06 of South Carolina Department of Transportation Standard Specifications For Highway Construction.
  - C. Woven Wire Backing: Comply with Section 815.06 of South Carolina Department of Transportation Standard Specifications For Highway Construction.

## PART 3 EXECUTION

### 3.1 GENERAL

- A. Grade and provide erosion protection for all disturbed areas outside structure lines by seeding or other erosion control devices. Provide sediment barriers in storm water conveyance systems at all entrances, intersections, change in direction, discharge points and other locations as shown on the drawings.

### 3.2 STABILIZATION BY SEEDING:

- A. As specified in Section 02924 – SEEDING AND MULCHING.

### 3.3 SEDIMENT BARRIERS

- A. Straw Bales For Sheet Flow Applications:
  - 1. Excavate a 4 inch deep trench the width of a bale and length of the proposed barrier. The barrier should be parallel to the slope. Place barrier 5 to 6 feet away from toe of slope, unless otherwise indicated;
  - 2. Place bales in the trench with their ends tightly abutting. Corner abutment is not acceptable. A tight fit is important to prevent sediment from escaping through spaces between the bales;
  - 3. Install and anchor as indicated in the construction drawings;
  - 4. Backfill the trench with the previously excavated soil and compact it. The backfill soil should conform to the ground level on the downhill side of the

barrier and should be built up to 4 inches above the ground on the uphill side of the bales;

5. Inspect and repair or replace damaged bales promptly. Remove the straw bales when the uphill sloped areas have been permanently stabilized.

B. Silt Fence For Sheet Flow Applications:

1. Excavate a 4 inch deep, 4 inch wide trench on the uphill side of the silt fence to entrench bottom portion of geotextile filter fabric;
2. Secure fence to steel post which are set at least 1.5 feet in the ground. Install as shown on detail;
3. Backfill the trench with the previously excavated soil and compact it;
4. Silt fence should generally follow the contour except in channel applications Where silt fence should continue up the bank to prevent flow around the end of fence;
5. Inspect and repair or replace damaged silt fence or fence that is undermined; Remove silt fence when the areas above the fence have been permanently stabilized.

C. Straw Bales For Channel Flow Applications:

1. Install straw bales as described for sheet flow with the following exceptions:
  - a. Place bales in a single row, lengthwise, oriented perpendicular to the flow, and with ends of adjacent bales tightly abutting one another;
  - b. Extend the barrier to such a length that the bottoms of the end bales are at a higher elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it. Place rock below the middle bale to dissipate the energy of the falling water and reduce downstream erosion.

D. Silt Fence For Channel Flow Applications:

1. Install silt fence as described for sheet flow with the following exceptions:
  - a. Silt fence in drainage channels must be backed with wire or steel mesh. Other locations on drawings may specify reinforced silt fence;
  - b. Extend silt fence up banks to prevent water flow around ends of fence.

### 3.4 INLET CONTROL SEDIMENT BARRIERS

A. Straw bales

1. Excavate a 4 inch deep trench around the inlet. Make the trench as wide as a straw bale;
2. Orient straw bales with the bindings around the sides of the bales rather than over and under the bales;
3. Place bales lengthwise around the inlet and press ends of adjacent bales together;
4. Drive two 2 inch by 2 inch by 4 feet wood stakes through each bale to anchor the bale securely in place;



## SECTION 02514

### WATER DISTRIBUTION SYSTEM

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Furnishing and installing pipelines and appurtenances for potable water system.
- B. Work under this section of the Specifications must be performed in accordance with the requirements in the Beaufort-Jasper Water & Sewer Authority Technical Specifications, Revised July 2009. Contractor shall have a copy of the aforementioned specifications at the site of the Work for the full duration of construction.
- C. In the event there is a conflict between the requirements contained in this section of the Specifications and the Beaufort-Jasper Water & Sewer Authority Technical Specifications, the requirements in the Beaufort-Jasper Water & Sewer Authority Technical Specifications shall govern.

##### 1.2 MEASUREMENT AND PAYMENT

- A. Water Line:
  - 1. Basis of Measurement: linear feet of pipe water line in place measured thru fittings.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid per lineal foot for the indicated type and size water line pipe and shall include all costs for pipe, installation, marker tape, tracer wire, testing, sampling, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. PVC Pipe Water Line - \_\_\_\_-inch.
    - b. Ductile Iron Pipe Water Line - \_\_\_\_-inch.
- B. Fittings:
  - 1. Basis of Measurement: Total number of fittings of each type and size indicated, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each, type and size fitting, and shall include all costs for fittings, gaskets, glands, bolts, nuts, lubricants, installation, testing and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. *(Size) (Type:Description)*

- C. Additional For Restrained Joint
1. Basis of Measurement: Each restrained pipe joint installed at the locations and to the limits indicated on the Drawings.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each restrained pipe joint for the type and size of pipe indicated and shall include all additional costs for material, labor and other costs required to construct a restrained joint in accordance with this section of the Specifications, regardless of style of joint, over and above the costs for installing a non restrained joint.
  3. Pay Items:
    - a. Additional For Restrained Joint, \_\_\_-inch PVC Pipe
    - b. Additional For Restrained Joint, \_\_\_-inch Ductile Iron Pipe
- D. Gate Valve And Valve Box
1. Basis of Measurement: Each gate valve and valve box, complete in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each Gate Valve and Valve Box, (size indicated) and shall include all costs for valve, valve box, valve operating key, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch Gate Valve and Valve Box
- E. Butterfly Valve and Valve Box
1. Basis of Measurement: Each butterfly valve and valve box, complete in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each Butterfly Valve and Valve Box, (size indicated) and shall include all costs for valve, valve box, valve operating key, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch Butterfly Valve and Valve Box
- F. Post Indicator Valve
1. Basis of Measurement: Each post indicator valve, complete in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each Post Indicator Valve (size indicated) and shall include all costs for UL/FM approved gate valve, indicator post, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch Post Indicator Valve
- G. Fire Line Isolation Valve And Lockable Valve Box

1. Basis of Measurement: Each fire line isolation gate valve and lockable valve box, complete in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each Fire Line Isolation Gate Valve and Lockable Valve Box (size indicated) and shall include all costs for valve, valve box, valve operating key, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch Fire Line Isolation Gate Valve and Lockable Valve Box
- H. Fire Hydrant With Auxiliary Gate Valve and Valve Box:
1. Basis of Measurement: Each fire hydrant with auxiliary gate valve and valve box, complete in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each fire hydrant with auxiliary gate valve and valve box and shall include all costs for hydrant, UL/FM approved gate valve, valve box, installation, gravel drain, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. Fire Hydrant With Auxiliary Gate Valve and Valve Box
- I. Air Release Valve Assembly and Manhole:
1. Basis of Measurement: Each air release valve and manhole, complete in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each air release valve (size indicated) and manhole and shall include all costs for air release valve, tapping saddle, corporation stop, incidental piping; precast manhole, cast iron frame and cover, installation and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch Air Release Valve and Manhole
- J. Service Lines:
1. Basis of Measurement: Linear feet of service line, type and size as indicated, extending from main to point of termination or to connection at meter box.
  2. Basis of Payment: Payment will be made at the Unit Price bid per linear foot for service line (type and size indicated) and shall include all costs for pipe, tapping saddle, tap, corporation stop, incidental fittings and adapters, installation, marker tape, tracer wire, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:

- a. Polyethylene Pipe Service Line - \_\_\_\_-inch
  
- K. Service Tap
  - 1. Basis of Measurement: Each service tap, size as indicated.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each service tap, size indicated, and shall include all costs for tapping saddle, making the tap, corporation stop, incidental fittings and adapters, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. Water Service Tap – 1-inch
    - b. Water Service Tap – 2-inch
  
- L. Blow-Off Hydrant
  - 1. Basis of Measurement: Each blow-off hydrant installed at the locations indicated on the Drawings.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each blow-off hydrant, and shall include all costs for post type hydrant, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Post Type Blow-Off Hydrant
  
- M. Yard Hydrant
  - 1. Basis of Measurement: Each yard hydrant installed at the locations indicated on the Drawings.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each yard hydrant and shall include all costs for hydrant, incidental fittings and adapters, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Yard Hydrant
  
- N. Concrete Markers
  - 1. Basis of Measurement: Each concrete marker, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each concrete marker and shall include all costs for precast concrete post, installation, excavation, backfill, disposal of unsuitable material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. Concrete Markers

- O. Connection To Existing Water Line – Dry Connection
  - 1. Basis of Measurement: Each connection to existing water line using MJ tee and sleeve with existing water line de-activated.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each dry connection to existing water line and shall include all costs for cutting existing pipe, installation and connections to existing, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. Connection To Existing Water Line – Dry Connection
  
- P. Connection To Existing Water Line – Wet Connection:
  - 1. Basis of Measurement: Each connection to existing water line using tapping sleeve and tapping valve with existing water line active (wet tap).
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each wet tap connection to existing water line and shall include all costs for tapping valve, valve box, tapping machine, making the tap, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items;
    - a. Connection To Existing Water Line – Wet Connection

### 1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM):
  - 1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 2. ASTM C857 – Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
  - 3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 5. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
  - 6. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
  - 7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  - 9. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

10. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

B. American Water Works Association (AWWA):

1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1,219 mm), for Water.
3. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
5. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
6. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
7. AWWA C500 - Gate Valves for Water and Sewage Systems.
8. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
9. AWWA C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.
10. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 12 In. (100 mm through 300 mm), for Water Distribution.
11. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 36 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.

C. Beaufort-Jasper Water & Sewer Authority Water System Standards and Specifications-Revised July, 2009.

1. Chapter 2 – Earthwork
2. Chapter 6 – Pipeline Materials, Valves and Appurtenances
3. Chapter 7 – Water System Standards
4. Chapter 13 – Approved Manufacturers

#### 1.4 SUBMITTALS

- A. Section 01001 – General Requirements: Submittal Procedures
- B. Product Data: Manufacturer’s Catalog cuts and product data for all pipe, fittings and appurtenances.
- C. Test Reports:
  1. Certified factory hydrostatic test results for each shipment of pipe.
  2. Field hydrostatic test

## PART 2 PRODUCTS

2.1 Comply with material requirements in Chapter 6 of Beaufort-Jasper Water & Sewer Authority Technical Specifications – Revised July, 2009.

A. Approved manufacturers

1. Beaufort-Jasper Water & Sewer Authority Technical Specifications – Revised July 2009, Chapter 13.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Notification Of Intent To Excavate:

1. Comply with South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978). Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.

B. Approximate location of certain underground lines and structures are shown on the plans for information only and additional underground lines or structures may exist that are not shown.

1. Call Palmetto Utility Protection Service at 1-888-721-7877 between the hours of 7:00 AM and 7:00 PM Monday thru Friday at least three working days before commencing construction. Request underground utilities to be located and marked within and surrounding construction areas.

### 3.2 TRENCH EXCAVATION AND BACKFILL

A. Perform trench excavation and backfill in accordance with the requirements in Section 02324, Excavation, Backfill for Utilities.

### 3.3 PIPE INSTALLATION

A. Install pipelines and appurtenances in accordance with the requirements in Chapter 7 of Beaufort-Jasper Water & Sewer Authority Technical Specifications Revised July, 2009

### 3.4 FIELD QUALITY CONTROL

A. Testing and disinfection of pipe lines to be in accordance with Chapter 7 of Beaufort-Jasper Water & Sewer Authority Technical Specifications Revised July, 2009.

END OF SECTION

## SECTION 02536

### SANITARY SEWER FORCE MAIN

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Furnishing and installing piping and appurtenances for sanitary sewer force mains.
- B. Work under this section of the Specifications must be performed in accordance with the requirements in the Beaufort-Jasper Water & Sewer Authority Technical Specifications, Revised July, 2009. Contractor shall have a copy of the aforementioned specifications at the site of the Work for the full duration of construction.
- C. In the event there is a conflict between the requirements contained in this section of the Specifications and the Beaufort-Jasper Water & Sewer Authority Technical Specifications, the more restrictive or more stringent requirement shall be applied.

##### 1.2 MEASUREMENT AND PAYMENT

- A. General:
  - 1. Section 01001 – General Requirements, Article 1.4 – Unit Prices.
  - 2. Payment will be made for the following items of work under this section of the specifications when the item is shown on the Schedule of Bid Prices included in the Bid Form and attached to the Agreement.
- B. Sanitary Sewer Force Main:
  - 1. Basis of Measurement: Linear feet of sanitary sewer force main, size and type indicated, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for Sanitary Sewer Force Main, size and type indicated, and shall include all costs for pipe, fittings, installation, testing, excavation, backfill, trench bracing, disposal of unsuitable material, placing foundation stabilization and embedment material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. \_\_\_\_-inch PVC Pipe Sanitary Sewer Force Main
    - b. \_\_\_\_-inch DIP Sanitary Sewer Force Main
- C. Ductile Iron Fittings For Sanitary Sewer Force Main:
  - 1. Basis of Measurement: Total number of fittings of each type and size indicated, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for each, type and size fitting, and shall include all costs for fittings, gaskets,



glands, bolts, nuts, lubricants, installation, testing and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.

3. Pay Items:
  - a. (Size) (Type:Description)

D. Plug Valve and Valve Box:

1. Basis of Measurement: Each gate valve and valve box, complete in place.
2. Basis of Payment: Payment will be made at the Unit Price bid for each Plug Valve and Valve Box, (size indicated) and shall include all costs for valve, valve box, valve operating key, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Items:
  - a. \_\_\_-inch Plug Valve and Valve Box

E. Gate Valve And Valve Box

1. Basis of Measurement: Each gate valve and valve box, complete in place.
2. Basis of Payment: Payment will be made at the Unit Price bid for each Gate Valve and Valve Box, (size indicated) and shall include all costs for valve, valve box, valve operating key, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Items:
  - a. \_\_\_-inch Gate Valve and Valve Box

F. Check Valve and Valve Manhole

1. Basis of Measurement: Each check valve and valve manhole, complete in place.
2. Basis of Payment: Payment will be made at the Unit Price bid for each check Valve and Valve Manhole, (size indicated) and shall include all costs for valve, valve manhole, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Items:
  - a. \_\_\_-inch Check Valve and Valve Manhole

G. Connection To Existing Sanitary Sewer Force Main – Dry Connection

1. Basis of Measurement: Each connection to existing force main using MJ tee and sleeve with existing force main de-activated.
2. Basis of Payment: Payment will be made at the Unit Price bid for each dry connection to existing force main and shall include all costs for cutting existing pipe, installation and connections to existing, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.

3. Pay Items:
  - a. Connection To Existing Force Main – Dry Connection
- H. Connection To Existing Sanitary Sewer Force Main – Wet Connection:
  1. Basis of Measurement: Each connection to existing force main using tapping sleeve and tapping valve with existing force main active (wet tap).
  2. Basis of Payment: Payment will be made at the Unit Price bid for each wet tap connection to existing force main and shall include all costs for tapping valve, valve box, tapping machine, making the tap, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items;
    - a. Connection To Existing Force Main – Wet Connection

### 1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM):
  1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  3. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  4. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  5. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  6. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
  7. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
  8. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  9. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
  10. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
  11. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  12. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  13. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  14. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

- B. American Water Works Association (AWWA):
  - 1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
  - 2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 3. AWWA C150 - ANSI Standard for the Thickness Design of Ductile Iron Pipe.
  - 4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - 5. AWWA C153 - American National Standard for Ductile-Iron Compact Fittings for Water Service.
  
- C. Beaufort-Jasper Water & Sewer Authority Technical Specifications, Revised July, 2009.
  - 1. Chapter 2 – Earthwork
  - 2. Chapter 6 – Pipeline Materials, Valves and Appurtenances
  - 3. Chapter 8 – Wastewater System Standards
  - 4. Chapter 9 – Concrete structures, manholes, and appurtenances
  - 5. Chapter 13 – Approved Manufacturers

#### 1.4 SUBMITTALS

- A. Section 01001 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Manufacturer's catalog cuts and product data for all pipe, fittings and manholes.
- C. Test Reports:
  - 1. Deflection test
  - 2. Pressure Test

#### PART 2 PRODUCTS

- 2.1 Comply with material requirements in Chapter 6 of Beaufort-Jasper Water & Sewer Authority Technical Specifications – Revised July, 2009.
  - A. Approved manufacturers
    - 1. Beaufort-Jasper Water & Sewer Authority Technical Specifications – Revised July, 2009, Chapter 13.

#### PART 3 EXECUTION

##### 3.1 EXAMINATION

- A. Notification Of Intent To Excavate:

1. Comply with South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978). Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.
- B. Approximate location of certain underground lines and structures are shown on the plans for information only and additional underground lines or structures may exist that are not shown.
1. Call Palmetto Utility Protection Service at 1-888-721-7877 between the hours of 7:00 AM and 7:00 PM Monday thru Friday at least three working days before commencing construction. Request underground utilities to be located and marked within and surrounding construction areas.
- 3.2 TRENCH EXCAVATION AND BACKFILL
- A. Perform trench excavation and backfill in accordance with the requirements in Section 02324, Excavation, Backfill for Utilities.
- 3.3 PIPE INSTALLATION
- A. Install pipelines and appurtenances in accordance with the requirements in Chapter 8 of Beaufort-Jasper Water & Sewer Authority Technical Specifications Revised July, 2009.
- 3.4 FIELD QUALITY CONTROL
- A. Testing of sewer pipe lines to be in accordance with Chapter 8 of Beaufort-Jasper Water & Sewer Authority Technical Specifications Revised July, 2009.

END OF SECTION

## SECTION 02537

### GRAVITY SANITARY SEWER SYSTEM

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Furnishing and installing piping, manholes and appurtenances for gravity sanitary sewer system.
- B. Work under this section of the Specifications must be performed in accordance with the requirements in the Beaufort-Jasper Water & Sewer Authority Technical Specifications, Revised July, 2009. Contractor shall have a copy of the aforementioned specifications at the site of the Work for the full duration of construction.
- C. In the event there is a conflict between the requirements contained in this section of the Specifications and the Beaufort-Jasper Water & Sewer Authority Technical Specifications, the more restrictive or the more stringent requirement shall be applied.

##### 1.2 MEASUREMENT AND PAYMENT

- A. General:
  - 1. Section 01001 – General Requirements, Article 1.4 – Unit Prices.
  - 2. Payment will be made for the following items of work under this section of the specifications when the item is shown on the Schedule of Bid Prices included in the Bid Form and attached to the Agreement.
- B. PVC Pipe Gravity Sanitary Sewer:
  - 1. Basis of Measurement: Linear feet of PVC gravity sanitary sewer pipe, size and depth indicated, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for PVC Pipe Gravity Sanitary Sewer, size and depth indicated, and shall include all costs for pipe, fittings, installation, testing, excavation, backfill, trench bracing, disposal of unsuitable material, placing foundation stabilization and embedment material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. \_\_\_-inch PVC Pipe Gravity Sanitary Sewer, To 8-ft. Depth
    - b. \_\_\_-inch PVC Pipe Gravity Sanitary Sewer, 8-ft. to 12-ft. Depth
    - c. \_\_\_-inch PVC Pipe Gravity Sanitary Sewer, 12-ft. To 16-ft. Depth
    - d. \_\_\_-inch PVC Pipe Gravity Sanitary Sewer, 16-ft. To 20-ft. Depth
- C. DIP Gravity Sanitary Sewer:

1. Basis of Measurement: Linear feet of DIP gravity sanitary sewer pipe, size and depth indicated, in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for DIP Gravity Sanitary Sewer, size and depth indicated, and shall include all costs for pipe, fittings, installation, testing, excavation, backfill, trench bracing, disposal of unsuitable material, placing foundation stabilization and embedment material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch DIP Gravity Sanitary Sewer, To 8-ft. Depth
    - b. \_\_\_-inch DIP Gravity Sanitary Sewer, 8-ft. to 12-ft. Depth
    - c. \_\_\_-inch DIP Gravity Sanitary Sewer, 12-ft. To 16-ft. Depth
    - d. \_\_\_-inch DIP Gravity Sanitary Sewer, 16-ft. To 20-ft. Depth
- D. Gravity Sanitary Sewer Service Lateral
1. Basis of Measurement: Linear feet of gravity sanitary sewer lateral, size indicated, in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for Gravity Sanitary Sewer Service Lateral, size indicated, and shall include all costs for pipe, fittings, installation, testing, excavation, backfill, trench bracing, disposal of unsuitable material, placing foundation stabilization and embedment material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications. Service wye will be paid for under the Bid Item for PVC Wye.
  3. Pay Items:
    - a. 4-inch Gravity Sanitary Sewer Service Lateral
    - b. 6-inch Gravity Sanitary Sewer Service Lateral
- E. PVC Cleanout:
1. Basis of Measurement: Each PVC clean-out, size as indicated, in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for PVC Cleanout, size as indicated, and shall include all costs for pipe, fittings, installation, testing, excavation, backfill, disposal of unsuitable material, placing foundation stabilization and embedment material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch PVC Cleanout
- F. PVC Wye:
1. Basis of Measurement: Each PVC wye, size as indicated, in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for PVC Wye, size as indicated, and shall include all costs for pipe, fittings, installation, testing, excavation, backfill, disposal of unsuitable material, placing foundation stabilization and embedment material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:

- a. \_\_\_\_-inch x \_\_\_\_-inch PVC Wye
- G. Grease Trap:
  - 1. Basis of Measurement: Each grease trap, Size as indicated, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for Grease Trap, size indicated and shall include all costs for grease trap, pipe, fittings, installation, testing, excavation, backfill, disposal of unsuitable material, placing foundation stabilization material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. \_\_\_\_\_ Gallon Grease Trap
- H. Manholes To 6-ft. Depth:
  - 1. Basis of Measurement: Each Manhole, for a nominal depth up to 6-feet, measured from rim to invert of manhole, and with frame and cover, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for Manholes To 6-ft. Depth and shall include all costs for precast manhole barrel sections, base, top, cone section, joint gaskets, interior coating, exterior joint collars, cast iron frame and cover, flexible connectors, steps, invert fill, installation, testing, excavation, backfill, disposal of unsuitable material, placing foundation stabilization material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. 4-ft. diameter Manhole to 6-ft. Depth.
    - b. 5-ft. diameter Manhole to 6-ft. Depth.
    - c. 6-ft. diameter Manhole to 6-ft. Depth.
- I. Additional Manhole Depth:
  - 1. Basis of Measurement: Additional vertical feet of depth of manhole over 6-feet.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid per vertical foot for Additional Manhole Depth and shall include all costs for additional manhole barrel, joint gaskets, interior coating, exterior joint collars, installation, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Items:
    - a. 4-ft. Diameter Manhole, Additional Depth.
    - b. 5-ft. Diameter Manhole, Additional Depth.
    - c. 6-ft. Diameter Manhole, Additional Depth.
- J. Manhole Drop Pipe:
  - 1. Basis of Measurement: Each vertical drop pipe installed at drop manhole in accordance with the details on the Drawings, length measured from the invert of the incoming sanitary sewer to the invert of the drop pipe discharging into the manhole.

2. Basis of Payment: Payment will be made at the unit price bid for each manhole drop pipe, size and length indicated, and shall include all costs for pipe, fittings, installation, concrete encasement and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_\_-inch Manhole Drop Pipe, to 2-ft. Length
    - b. \_\_\_\_-inch Manhole Drop Pipe, 2-ft. to 4-ft. Length
    - c. \_\_\_\_-inch Manhole Drop Pipe, 4-ft. to 6-ft. Length
- K. Connect To Existing Manhole:
1. Basis of Measurement: Each connection to an existing manhole, complete.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each connection to existing manhole and shall include all costs for pipe, flexible connectors, gaskets, core drilling, installation, testing, excavation, backfill, disposal of unsuitable material, foundation stabilization and bedding and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Item;
    - a. Connection to Existing Manhole

### 1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM):
1. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
  2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  3. **ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.**
  4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  5. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  6. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  7. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  8. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
  9. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
  10. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  11. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.



12. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
  13. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  14. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  15. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  16. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- B. American Water Works Association (AWWA):
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
  3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  4. AWWA C150 - ANSI Standard for the Thickness Design of Ductile Iron Pipe.
  5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
  6. AWWA C153 - American National Standard for Ductile-Iron Compact Fittings for Water Service.
- C. Beaufort-Jasper Water & Sewer Authority Technical Specifications, Revised July, 2009.
1. Chapter 2 – Earthwork
  2. Chapter 6 – Pipeline Materials, Valves and Appurtenances
  3. Chapter 8 – Wastewater System Standards
  4. Chapter 9 – Concrete Structures, Manholes and Appurtenances
  5. Chapter 13 – Approved Manufacturers

#### 1.4 SUBMITTALS

- A. Section 01001 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Manufacturer's catalog cuts and product data for all pipe, fittings and manholes.
- C. Test Reports:
1. Air test
  2. Deflection test

## PART 2 PRODUCTS

2.1 Comply with material requirements in Chapter 6 of Beaufort-Jasper Water & Sewer Authority Technical Specifications – Revised July, 2009.

A. Approved manufacturers

1. Beaufort-Jasper Water & Sewer Authority Technical Specifications – Revised July, 2009, Chapter 13.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Notification Of Intent To Excavate:

1. Comply with South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978). Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.

B. Approximate location of certain underground lines and structures are shown on the plans for information only and additional underground lines or structures may exist that are not shown.

1. Call Palmetto Utility Protection Service at 1-888-721-7877 between the hours of 7:00 AM and 7:00 PM Monday thru Friday at least three working days before commencing construction. Request underground utilities to be located and marked within and surrounding construction areas.

### 3.2 TRENCH EXCAVATION AND BACKFILL

A. Perform trench excavation and backfill in accordance with the requirements in Section 02324, Excavation, Backfill for Utilities.

### 3.3 PIPE INSTALLATION

A. Install pipelines and appurtenances in accordance with the requirements in Chapter 8 of Beaufort-Jasper Water & Sewer Authority Technical Specifications Revised July, 2009.

### 3.4 FIELD QUALITY CONTROL

A. Testing of sewer pipe lines to be in accordance with Chapter 8 of Beaufort-Jasper Water & Sewer Authority Technical Specifications Revised July, 2009.

END OF SECTION

SECTION 02630  
STORM DRAINAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Storm drainage piping.
  - 2. Accessories.
  - 3. Catch basins
  - 4. Inlets
  - 5. Manholes and Junction Boxes
  - 6. Bedding and cover materials.
  
- B. Related Sections:
  - 1. Section 02324 – Trenching, Backfilling for Utilities

1.2 MEASUREMENT AND PAYMENT

- A. Storm Drain Pipe
  - 1. Basis of Measurement: Linear feet of storm drain pipe, type and size indicated, measured from centerline to centerline of structures, complete, in place. Depth measurement is from finished grade over pipe to invert of pipe.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid per linear foot for the type and size storm drain pipe indicated and at the depths indicated in the Schedule of Bid Prices and shall include all costs for pipe and accessories, installation, excavation, backfill, disposal of unsuitable material, foundation stabilization, pipe embedment and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications. No separate payment will be made for Class 2 or Class 3 embedment material obtained on the site of the construction. Payment for furnishing Class 2 or Class 3 material imported from off the site will be made under a separate bid item.
  - 3. Pay Items:
    - a.   15  -inch (*RCP*) Pipe to   -ft. Depth
    - b.   15  -inch (*RCP*) Pipe,   -ft. To   -ft. Depth
  
- B. Precast Reinforced Concrete Box Culvert
  - 1. Basis of Measurement: Linear feet of precast reinforced concrete box culvert, type and size indicated, measured from end to end, complete, in place.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid per lineal foot for precast reinforced concrete box culvert, size as indicated in the Schedule of Bid Items, and shall include all costs for precast culvert and accessories, precast concrete wing walls if applicable, installation,

excavation, backfill, disposal of unsuitable material, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.

3. Pay Items:
  - a. \_\_\_\_-ft. x \_\_\_\_-ft. Precast Reinforced Concrete Box Culvert.
  - b. Double \_\_\_\_-ft. x \_\_\_\_-ft. Precast Reinforced Concrete Box Culvert.

C. Cast-In-Place Concrete Box Culvert

1. Basis of Measurement: No separate measurement of quantities will be made for cast-in-place concrete box culverts.
2. Basis of Payment: Payment will be made at the Lump Sum Price bid for each separate cast-in-place concrete box culvert, location and size as indicated in the Schedule of Bid Prices, including wing walls where applicable, and shall include all costs for installation, concrete, reinforcing, forming, excavation, backfill, disposal of excess material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Item:
  - a. \_\_\_\_-ft. x \_\_\_\_-ft. Cast-In-Place Concrete Box Culvert, (Location)

D. Straight Headwall For Circular Pipe

1. Basis of Measurement: Each straight headwall installed at the location shown on the Drawings, complete in place.
2. Basis of Payment: Payment will be made at the Unit Price bid for each cast-in-place concrete straight headwall for circular pipe, size as indicated in the Schedule of Bid Prices, and shall include all costs for concrete, reinforcing, forming, excavation, backfill, disposal of excess material, installation, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Items:
  - a. Straight Headwall For Single \_\_\_\_-inch Circular Pipe
  - b. Straight Headwall For Double \_\_\_\_-inch Circular Pipe

E. Headwall With Wing Walls For Pipe

1. Basis of Measurement: Each headwall with wing walls for indicated type and size pipe installed at the location shown on the Drawings, complete in place.
2. Basis of Payment: Payment will be made at the Unit Price bid for each cast-in-place concrete headwall with wing walls for type and size pipe as indicated in the Schedule of Bid Prices, and shall include all costs for concrete, reinforcing, forming, excavation, backfill, disposal of excess material, installation, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Items:
  - a. Headwall With Wing Walls For Single \_\_\_\_-inch Pipe
  - b. Headwall With Wing Walls For Double \_\_\_\_-inch Pipe

F. Flared End Sections

1. Basis of Measurement: Each flared end section installed in accordance with the details on the drawings, complete, in place.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each flared end section, type and size as indicated in the Schedule of Bid Prices, and shall include all costs for flared end section, excavation, backfill, disposal of excess material, installation, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. \_\_\_-inch Reinforced Concrete Flared End Section
    - b. \_\_\_-inch Corrugated Plastic (HDPE) Flared End Section
- G. Storm Drain Structures To 6-ft. Depth
1. Basis of Measurement: Each catch basin, storm inlet, manhole or junction box constructed in accordance with the details on the drawings to a nominal depth of 6-ft., measured from grate or rim to invert of structure, and with frame and grate/cover installed.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each catch basin, storm inlet, manhole or junction box constructed up to a depth of 6-ft., identified by type in the Schedule of Bid Prices, and shall include all costs for excavation, backfill, disposal of excess material, construction, installation, cast iron frame and cover or grate where required, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  3. Pay Items:
    - a. Catch Basin, Type \_\_\_\_, To 6-ft. Depth
    - b. Drop Inlet, To 6-ft. Depth
    - c. Weir Inlet, To 6-ft. Depth
    - d. Manhole, To 6-ft. Depth
    - e. Junction Box, To 6-ft. Depth
- H. Storm Drain Structures, Additional Depth
1. Basis of Measurement: Additional vertical feet of depth of storm drain structure over 6-feet.
  2. Basis of Payment: Payment will be made at the Unit Price bid for each additional vertical foot of structure, identified by type in the Schedule of Bid Prices, and shall include all costs for additional riser sections, joint gaskets, interior coating, exterior joint collars, installation, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications
  3. Pay Items:
    - a. Catch Basin, Type \_\_\_\_, Additional Depth
    - b. Drop Inlet, Additional Depth
    - c. Weir Inlet, Additional Depth
    - d. Manhole, Additional Depth
    - e. Junction Box, Additional Depth
- I. Imported Class 2 and Class 3 Embedment Material

1. Basis of Measurement: Cubic yards of Class 2 and Class 3 material obtained from off-site borrow sources for use as embedment material. Measurement will be made in-place for material placed in accordance with the requirements of this section of the Specifications.
2. Basis of Payment: Payment will be made at the Unit Price bid for furnishing Class 2 and Class 3 Embedment Material obtained from off-site borrow sources and shall include all costs for loading, hauling, unloading, disposal of excess material and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
3. Pay Items:
  - a. Imported Embedment Material, Class 2
  - b. Imported Embedment Material, Class 3

### 1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  1. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 300-to 900-mm (12- to 36-in.) Diameter.
- B. ASTM International:
  1. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
  2. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
  3. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  4. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
  5. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
  6. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures
  7. ASTM C1478 - Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals
  8. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  9. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  10. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  11. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  12. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

13. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
14. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
15. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
16. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
17. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
18. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
19. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
20. ASTM F2306/F2306M - Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

#### 1.4 SUBMITTALS

- A. Section 01001 – General Requirements: Submittal Procedures
- B. Product Data: Submit manufacturer's product data for:
  1. Pipe, pipe accessories, gaskets, joint lubricants.
  2. Inlet grates
  3. Manhole frames and covers
  4. Precast drainage structures.
- C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

#### 1.5 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

## PART 2 PRODUCTS

### 2.1 STORM DRAINAGE PIPING

- A. Reinforced Concrete Pipe: **ASTM C76**, with Wall Type A, B, or C, bell and spigot joints.
  - 1. Fittings: fabricated from reinforced concrete pipe
  - 2. Joints: ASTM C443, rubber compression gasket.
  - 3. Pipe Class: Class III unless otherwise indicated on the drawings.
  
- B. Concrete Pipe: ASTM C14, unreinforced, bell and spigot joints.
  - 1. Fittings: Fabricated from concrete pipe.
  - 2. Joints: ASTM C443, rubber compression gasket.
  - 3. Pipe Class; As indicated on the drawings.
  
- C. Thermoplastic Pipe:
  - 1. High Density Polyethylene (HDPE): ASTM F 2306, Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
    - a. Fittings: Corrugated Polyethylene (HDPE)
    - b. Joints: Bell and spigot.
  - 2. Polyvinyl Chloride (PVC): ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber ring sealed gasket joint.
    - a. Fittings: PVC.
    - b. Joints: ASTM F477, elastomeric gaskets.

### 2.2 STORM DRAIN STRUCTURES

- A. Cast-in-place structures:
  - 1. Concrete: 28 day compressive strength – 3000 psi.
  - 2. Reinforcing: ASTM A615/A 615M, grade 60
  
- B. Precast structures:
  - 1. Round manholes: ASTM C478
    - a. Top: Precast concrete, concentric cone, eccentric cone, or flat slab type, as indicated on drawings.
    - b. Base: Precast concrete, with base riser section and separate base slab, or base riser section with integral floor, as indicated on drawings.
    - c. Steps: Ductile-iron or aluminum, integrally cast into manhole sidewalls.
  - 2. Square and rectangular structures: Design must meet or exceed the design requirements in ASTM C890 or ASTM C913.
  - 3. Precast reinforced concrete box with knock-out panel: Comply with the requirements on SCDOT standard drawing number 719-17 except for limitations contained herein.
    - a. Precast R.C. box with knock-out panel may be used for catch basins, drop inlets, shallow junction boxes and manholes.
    - b. Maximum depth from finished grade to top of box – 2'-0".



- c. Minimum inside dimensions of box – 4' x 4' x 4'.
  - d. Maximum inside dimensions of box – 5' x 5' x 6'.
  - e. Maximum bury depth, i.e. finished grade to floor of box, - 8'-0".
4. Precast reinforced concrete box with solid wall: Comply with the requirements on SCDOT standard drawing number 719-17A except for limitations contained herein.
- a. Precast R.C. box with solid walls may be used for catch basins, drop inlets, junction boxes and manholes.

### 2.3 FRAMES, GRATES AND COVERS:

- A. Material: ASTM A48, Class 30, gray cast iron.
- B. Bearing surfaces of circular medium and heavy duty manhole frames, covers and grates shall be machined to insure proper fit and prevent rattling.
- C. Unless otherwise indicated on the drawings, all frames grates and lids shall be classified heavy duty, designed for a 16,000 lb. wheel load.
- D. Watertight manhole covers, where indicated on the drawings, shall be bolted and gasketed.

### 2.4 PIPE CONNECTORS

- A. Resilient, ASTM C1478.

### 2.5 EMBEDMENT MATERIALS

- A. Angular stone material: Processed, graded aggregate; SCDOT #57 stone, ¾" maximum size, SCDOT Standard Specifications for Highway Construction.
- B. Select material: Acceptable soil material free of rocks, debris, frozen earth or foreign matter and free of excessive moisture.
- C. In general, soils from the following soil groups, as defined in ASTM D2487, are acceptable for use as pipe embedment: GW, GM, GC, GP, SM, SC, SW, SP, GW-GC, SP-SM, ML, CL, except that groups GM, GC, SM and SC soil material may only be used in dry trench conditions. Acceptability of soil material for use as pipe embedment is subject to the approval of the Engineer.
- D. Materials from the following soil groups as defined by ASTM D2487 are unacceptable for pipe embedment: MH, CH, OL, OH, and PT.
- E. Select material shall be obtained first from acceptable material excavated from the trench, second from acceptable material excavated elsewhere within the construction site and last from off-site borrow sources when approved by the Engineer.

- F. Soil material used for pipe embedment shall be placed at or near optimum moisture content. Moisture tempering of the soils used for embedment shall be the responsibility of the Contractor. No additional payment will be made for moisture tempering of soils.

## PART 3 EXECUTION

### 3.1 TRENCH EXCAVATION

- A. Excavate pipe trench in accordance with Section 02324 – Trenching, Backfilling For Utilities.
- B. Excavate to lines and grades indicated on the Contract Drawings or required to accommodate installation.
- C. Trench Width: Trench width at or below the top of the pipe shall be adequate to allow proper placement and consolidation of embedment material. The minimum trench width at or below the top of the pipe shall be the greater of either the pipe O.D. plus 16 inches or the pipe O.D. multiplied by 1.25 plus 12 inches.
- D. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.
- E. Protect and support existing sewer lines, utilities and appurtenances.
- F. Maintain profiles of utilities. Coordinate with other utilities to eliminate interferences. Notify Engineer where crossing conflicts occur.

### 3.2 INSTALLATION OF PIPE

- A. General
  - 1. Lay pipe to slope and alignment indicated on Contract Drawings. Begin at downstream end and progress upstream. Lay bell and spigot pipe with bells upstream.
  - 2. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Contract Drawings or by Engineer.
  - 3. Keep pipe and fittings clean until work is completed and accepted. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. In large, accessible piping, brushes and brooms may be used for cleaning. Flush lines between manholes if required to remove collected debris.
  - 4. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
  - 5. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

6. Install gaskets in accordance with manufacturer's recommendations for use of lubricants and other special installation requirements.
  7. Joint Adaptors: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.
- B. Concrete Pipe:
1. Install Concrete Pipe in accordance with American Concrete Pipe Association (ACPA) "Concrete Pipe Installation Manual".
  2. Foundation for Pipe: Support pipe and bedding on firm foundation. When a firm foundation is not encountered at the required grade, remove unstable material to a depth to provide adequate support for the pipe or as directed by the Engineer. Replace the excavated material with select material in 6" maximum layers compacted to 95% Modified Proctor, ASTM D1557 up to the bottom of the bedding.
  3. Pipe Bedding:
    - a. Use select material, well-graded sand or gravel. Angular stone may be used for pipe bedding. When angular stone is used, completely wrap bedding with filter fabric for drainage filtration to prevent soil migration into open voids.
    - b. Ensure that trenches are free of water when placing bedding.
    - c. Support the pipe by placing loose bedding material for a depth of the pipe O.D./24 or 3" minimum. When rock or unyielding material is encountered, extend the depth of the bedding to the pipe O.D./12 or 6" minimum.
    - d. Excavate bedding material at pipe bells and projected hubs to prevent excess loading and to provide uniform support for the full length of the pipe barrel.
    - e. Compact bedding material that is outside of the middle third of the pipe diameter in order to ensure proper support for the pipe. Ensure that bedding material outside the middle third of pipe is compacted to a minimum of 90% of the maximum dry density, Modified Effort, ASTM D1557. Ensure that compaction of bedding material does not cause the pipe to move.
    - f. Do not use Controlled Low Strength Material (CLSM), flowable fills or concrete for pipe bedding.
  4. Haunching
    - a. Following placing and joining of pipe, place select material or angular stone to the spring line of the pipe. When angular stone has been used for pipe bedding, the angular stone shall also be used for haunching and the entire stone bedding and haunching envelope shall be completely wrapped with filter fabric for drainage filtration to prevent soil migration.
    - b. Place select material in layers not exceeding 6 inches of compacted material and thoroughly compact to 90% of the maximum dry density, Modified Effort, ASTM D1557. The first lift must be sufficiently below the spring line such that the material can be worked into the haunch zone of the pipe. Perform compaction by the use of mechanical tampers with the assistance

of hand tamps when necessary. Thoroughly compact the material under the haunches of the pipe and ensure that the backfill soil is in continuous uniform contact with the side and joints of the pipe. Exercise sufficient care to prevent damaging or misaligning the pipe with the compaction equipment. Place and compact material on both sides of pipe for its full length before adding the next lift of material. Ensure that trenches are free of water when placing and compacting haunching material. Ensure that backfill process does not cause joint separation or displacement of the installed pipe.

5. Initial Backfill: Place initial backfill, consisting of select material, in 6-inch maximum layers to 1-foot above top of pipe. Carefully consolidate and compact each layer to the density specified for the remainder of the trench backfill (Section 02324 – Excavation, Backfilling for Utilities).
6. Trench Backfill: Place and compact remainder of backfill in accordance with Section 02324. Do not displace or damage pipe when compacting.

C. Thermoplastic Pipe:

1. Install PVC sanitary sewer pipe in accordance with ASTM D2321, Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, and the details included in the Contract Drawings.
2. Pipe Embedment:
  - a. In stable soils, extend trench excavation to a point 4” below the bottom of the pipe (6” in rock or unyielding material). Install pipe bedding consisting of angular stone to provide uniform support for the full length of the pipe. Excavate for pipe bells at joints. After pipe is installed to line and grade, place angular stone material in 6-inch maximum layers to spring line of pipe. Carefully consolidate each layer to completely fill space below and around pipe, taking care not to disturb the pipe.
  - b. Where soft or unstable soils incapable of supporting the pipe are encountered at the bottom of the trench, extend trench excavation to the depth necessary for the soil conditions or as directed by the Engineer. Install foundation stabilization and pipe bedding consisting of angular stone material, placed and consolidated to provide uniform support for the full length of the pipe. Excavate for pipe bells at joints. After pipe is installed to line and grade, continue placing and consolidating the angular stone to the spring line of the pipe, taking care not to disturb the pipe.
  - c. Completely wrap angular stone material in filter fabric to prevent migration of adjacent soils.
  - d. Initial Backfill: Place initial backfill, consisting of select material, in 6-inch maximum layers to 1-foot above top of pipe. Carefully consolidate and compact each layer to 95% modified Proctor, ASTM D1557.
3. Trench Backfill: Place and compact remainder of backfill in accordance with Section 02324. Do not displace or damage pipe when compacting.

### 3.3 INSTALLATION – DRAINAGE STRUCTURES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place Cast-In-Place Concrete base pad, with provision for storm drain pipe end sections.
- C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
- E. Mount cover/grate and frame level in grout, secured to top and at elevation indicated. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.
- F. Provide rubber joint gasket complying with ASTM C 443-98 at joints of precast structure sections.
- G. Apply bituminous mastic coating at joints of sections.

### 3.4 FIELD QUALITY CONTROL

- A. Request inspection prior to and immediately after placing initial backfill.
- B. Compaction Testing:
  - 1. Laboratory density and moisture content: ASTM D698
  - 2. Field density; ASTM D2922
  - 3. Field moisture content: ASTM D3017.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Compaction Tests: One test for each 500 linear feet of storm drain pipe or fraction thereof.

### 3.5 PROTECTION OF FINISHED WORK

- A. Protect pipe and initial backfill from damage or displacement until backfilling operation is in progress.
  - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
  - 2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

5. Backfill the excavated soil and compact it against the bales;
6. Wedge loose straw between bales to prevent water from flowing between bales.

B. Silt fence

1. Excavate a 4 inch deep, 4 inch wide trench around inlet to intrench bottom portion of geotextile filter fabric;
2. Secure fence to steel post which are set at least 1.5 feet in the ground around inlet;
3. Backfill the trench with the previously excavated soil and compact it.

3.5 RIP-RAP

- A. Install quantity shown on the drawings.
- B. Place by hand on undisturbed material or compacted soil covered by Filter Fabric. Form a compact layer approximately 12" in thickness. Rip-rap should be laid on the filter fabric leaving no visible fabric.

3.6 SITE ENTRANCE/EXIT

- A. Install a 6 inch layer of gravel the full width of the vehicle ingress and egress area and for a length of 50 feet minimum, periodically add additional stone to maintain the proper functioning of the pad.

3.7 INSPECTION AND MAINTENANCE

- A. Inspect all erosion control features at least once every seven days and within 24 hours following any storm that is 0.5 inches or greater.
- B. Repair and maintain erosion control measures as needed and as directed by the Engineer and Owner.
- C. Maintain required records of inspections on site and make them available to SCDHEC inspectors when required.
- D. Cooperate with inspectors from SCDHEC, EPA, and Beaufort County and make modifications and repairs to erosion control devices as instructed by those agencies.
- E. Maintain erosion control measures in place until all disturbed areas outside pavements are stabilized as determined by the permitting agency.

END OF SECTION

SECTION 02725  
ASPHALT BASE COURSE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Hot Mix Asphalt Base Course, Types A and B.
- B. Related Sections:
  - 1. Section 02300 - Earthwork
  - 2. Section 02721 - Aggregate Base Course
  - 3. Section 02740 – Hot Mix Asphalt Pavement
  - 4. Section 02750 – Portland Cement Concrete Pavement

1.2 MEASUREMENT AND PAYMENT

- A. Bituminous Tack Coat:
  - 1. Basis of Measurement: Gallons of bituminous tack coat applied at the rate specified herein.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid per gallon for bituminous tack coat and shall include all costs for material, hauling, application, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item:
    - a. Bituminous Tack Coat Unit  
Gal.
- B. No measurement or payment will be made for removal and replacement of material which does not meet the quality requirements specified herein.

1.3 REFERENCES

- A. Asphalt Institute:
  - 1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
  - 2. AI MS-19 - Basic Asphalt Emulsion Manual.
- B. ASTM International:
  - 1. ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
  - 2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
  - 3. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
  - 4. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

5. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
- C. South Carolina Department of Transportation (SCDOT)
  1. Standard Specifications for Highway Construction
  2. Supplemental Technical Specifications

#### 1.4 SUBMITTALS

- A. Section 01001 – General Requirements: Requirements for submittals.
- B. Product Data:
  1. Aggregates
  2. Bituminous Material
- C. Job Mix Formula
- D. Manufacturer's Certificate: Certify all Products meet or exceed specified requirements

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with South Carolina Department of Transportation standards except where otherwise directed in this section of the specifications.

### PART 2 PRODUCTS

2.1 GENERAL: Asphalt base courses A and B mixes and materials shall comply with the requirements contained in the applicable sections of the South Carolina Department of Transportation Standard Specifications for Highway Construction cited herein along with the following SCDOT Supplemental Specifications:

- A. Standard Specifications for Hot-Mix Asphalt Material Properties SCDOT Designation: SC-M-402 (06), dated July 1, 2006.

#### 2.2 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01001 – General Requirements: Testing and Inspection Laboratory Services:
- B. Submit proposed mix design for each class of mix for review prior to beginning of Work.

#### 2.3 MATERIALS

- A. Asphalt Binder: Performance grade binder, PG64-22 in accordance with Subsection 401.2.1 of South Carolina Department of Transportation Standard Specifications for Highway Construction.



- B. Aggregates: In accordance with Subsection 401.2.2 of South Carolina Department of Transportation Standard Specifications for Highway Construction
- C. Additives: In accordance with Subsection 310.2.3 of South Carolina Department of Transportation Standard Specifications for Highway Construction.
- D. Composition of Mixture:
  - 1. Comply with requirements in Subsection 310.2.4 of South Carolina Department of Transportation Standard Specifications for Highway Construction.
  - 2. Mix Design: Prepare mix design in laboratory approved by the Engineer. Job mix formula to indicate a single definite percentage of aggregate passing each required sieve and a single definite percentage of asphalt binder to be contained in the mixture. This percentage of asphalt binder being the percentage recovered by SC-T-64 or SC-T-75 and will not include any asphalt binder that may be absorbed in the aggregates. If an anti-stripping agent or other additives are required, the percentage of each to be incorporated into the mixture will also be indicated in the job mix formula.
  - 3. Submit intended source of materials and job mix formula in writing to the Engineer. Do not commence any asphalt paving work or accept any asphalt materials until Engineer has approved source of material and job mix formula.

## 2.4 EQUIPMENT

- A. Comply with the requirements in Subsection 401.3 of the South Carolina Department of Transportation Standard Specifications for Highway Construction.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify compacted base course or sub base course is dry and ready to support paving.
- B. Verify gradients and elevations of base are correct.
- C. Verify gutter drainage grates and frames, manhole frames and valve boxes are installed in correct position and elevation.

### 3.2 PRIME AND TACK COATS

- A. Apply prime and tack coats in accordance with Subsection 401.4.18 of South Carolina Department of Transportation Standard Specifications for Highway Construction.

### 3.3 PLACING ASPHALT BASE COURSE

- A. Spreading and Finishing: In accordance with Subsection 401.4.19 of South Carolina Department of Transportation Standard Specifications for Highway Construction and as specified herein.
- B. Compaction:
  - 1. Contractor may select the equipment for spreading and compacting the mixture, except that intermediate rolling is to be accomplished with a pneumatic roller.
  - 2. The Contractor is responsible for monitoring the compaction process and will be responsible for making adjustments in equipment or roller patterns so that the finished asphalt pavement will meet the specified in-place density requirement.
  - 3. Any patching and traffic control required during compaction monitoring and acceptance testing procedures will be furnished by the Contractor.
- C. Joints: In accordance with Subsection 401.4.23 of South Carolina Department of Transportation Standard Specifications for Highway Construction.

### 3.4 TOLERANCES

- A. Surface Smoothness:
  - 1. Maximum variation of 3/8 inch using 10 foot straight edge.
- B. Compacted Thickness: Within 1/2 inch of specified thickness.
- C. Areas of asphalt base course outside the tolerance limits shall be removed and replaced or otherwise corrected to the satisfaction of the Engineer by the Contractor and re-tested.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01001 – General Requirements: Quality Control:
- B. All nuclear gage tests and cores required for compaction monitoring and acceptance testing procedures will be obtained by the Contractor using equipment and procedures approved by the Engineer.
- C. Core sample locations shall be repaired by the contractor.
- D. The Contractor is responsible for monitoring the lay down and compaction operations to assure that the final pavement is in compliance with the requirements specified herein. Nuclear gage testing may be used for quality control during the lay down process.
- E. Acceptance testing: Acceptance of each type of hot mix asphalt pavement will be based on the following:
  - 1. Each day's production of hot mixed asphalt will be considered a lot.

2. One bulk sample will be collected from each 250 tons, or portion thereof, of asphalt produced each day. The following tests and procedures will be performed on the material from each bulk sample collected:
    - a. Asphalt extraction
    - b. Aggregate gradation
    - c. Marshall specimens (3)
      - 1) Bulk density determination
      - 2) Stability
      - 3) Plastic flow
  3. The average daily field laboratory density shall be the average of the bulk densities for all the samples taken from the production for that day.
  4. Marshall Specimens used for compaction control must meet required air void criteria.
  5. Core samples:
    - a. Frequency: One core for each 250 tons of hot mix asphalt placed each day.
    - b. Utility trench patches: Core samples not required.
    - c. Location: As determined by the Engineer.
    - d. Each core sample will be tested for;
      - 1) Density
      - 2) Thickness
  6. The average core density for a lot shall be at least 96% of the average daily field laboratory density as determined by the Marshall method of test. Individual core densities shall not be less than 95% of the average field laboratory density.
- F. When an asphalt mixture is rejected, additional cores will be taken and tested by the Contractor at locations selected by the Engineer in order to determine the extent of the material to be removed and replaced.
- G. Pavement that is removed and replaced shall be re-tested by coring at the frequency indicated above, but not less than one core for each separate area of replaced pavement.

### 3.6 PROTECTION OF FINISHED WORK

- A. Protection of Finished Work: The newly constructed surfaces shall be protected from traffic until the mixture has hardened sufficiently to prevent distortion. The surface shall be kept clean and free from foreign material.

END OF SECTION

SECTION 02750

PORTLAND CEMENT CONCRETE PAVEMENT, SIDEWALK, CURBS AND GUTTERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Concrete paved roadways and parking areas
  - 2. Concrete sidewalks.
  - 3. Concrete curbs and gutters.
- B. Related Sections:
  - 1. Section 02300 - Earthwork
  - 2. Section 02740 – Hot Mixed Asphalt Pavement

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Concrete Pavement:
  - 1. Basis of Measurement: Square yards of concrete pavement, thickness indicated.
  - 2. Basis of Payment: Payment will be made at the unit price bid per square yard for concrete pavement (thickness indicated) and will include all costs for concrete, preparing base, forming, placing, testing, mix design and all other costs of whatever nature required to complete the Work as described herein and as shown on the Drawings.
  - 3. Pay Item Units  
      2  -in. Concrete Pavement S.Y
- B. Concrete Curb, Gutter, and Combination Curb and Gutter:
  - 1. Basis of Measurement: Linear feet of concrete curb, gutter or combination curb and gutter, in place.
  - 2. Basis of Payment: Payment will be made at the unit price bid per linear foot for concrete curb, gutter or combination curb and gutter, type indicated, and will include all costs for concrete, preparing base, forming, placing, testing, mix design and all other costs of whatever nature required to complete the Work as described herein and as shown on the Drawings.
  - 3. Pay Item Units  
    Concrete Drive-Over Curb and Gutter L.F.  
    Concrete Flush Header Curb L.F.
- C. Concrete Sidewalk:
  - 1. Basis of Measurement: Square yards of concrete sidewalk in place, thickness indicated.

2. Basis of Payment: Payment will be made at the unit price bid per square yard for concrete sidewalk, thickness indicated, and will include all costs for concrete, preparing base, forming, placing, testing, mix design and all other costs of whatever nature required to complete the Work as described herein and as shown on the Drawings.
3. Pay Item Units  
Concrete Sidewalk S.Y.

### 1.3 REFERENCES

- A. American Concrete Institute:
  1. ACI 301 - Specifications for Structural Concrete.
  2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- B. ASTM International:
  1. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
  2. ASTM A 497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  3. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  4. ASTM C 33 - Standard Specification for Concrete Aggregates.
  5. ASTM C 39 – Standard Specification Compressive Strength of Cylindrical Concrete Specimens.
  6. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.
  7. ASTM C 150 - Standard Specification for Portland Cement.
  8. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  9. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  10. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.
  11. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
  12. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants.
  13. ASTM C 1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
  14. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  15. ASTM D 1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
  16. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

17. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

#### 1.4 SUBMITTALS

- A. Section 01001 – General Requirements: Submittal Procedures
- B. Product Data:
  1. Joint filler
  2. Admixtures
  3. Curing compounds
- C. Manufacturer's Certification: Cement
- D. Test reports: Coarse aggregate and Fine aggregate
- E. Concrete mix design

#### 1.5 QUALITY ASSURANCE

- A. Obtain cementitious materials from same source throughout project.

#### 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when air temperature in the shade and away from artificial heat is 40 degrees F or lower, or when surface is wet or frozen. Concrete shall not be placed when the temperature is expected to fall below 32 degrees F during the early stages of curing.

### PART 2 PRODUCTS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.
- C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.
- D. Dowels: ASTM A 615; 40 ksi yield grade, plain steel, galvanized finish.
- E. Concrete Materials:
  1. Portland Cement: ASTM C 150, Type 1. Use only one brand cement throughout the project.

2. Concrete Aggregates: Natural aggregates, free from deleterious coatings conforming to ASTM C 33, together with all referenced ASTM Standard Specifications.
  3. Fine Aggregates: Conform to ASTM C 33. Materials finer than the 200 sieve not to exceed 4 percent. Use only clean, sharp natural sand.
  4. Course Aggregates: Use only natural gravels, a combination of gravels and crushed gravels, crushed stone, or a combination of these materials containing no more than 15% flat or elongated particles (long dimension more than five times the short dimension). Materials finer than the 200 sieve not to exceed 0.5%.
- F. Preformed Expansion Joint Materials: Bituminous fiber type conforming to ASTM D 1751.
- G. Wood Dividers: Redwood, Construction Heart Grade.
- H. Anti-spalling Compound: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.
- I. Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A. Moisture loss to be no more than .055 gr./ sq. cm. when applied at 200 sq. ft. / gal.
- J. Bonding Compound: Polyvinyl acetate or acrylic base, re-wettable type.
- K. Epoxy Adhesive: ASTM C 881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements in accordance with manufacturer's instructions. .

## 2.2 CONCRETE MIX DESIGN

- A. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (super plasticizer), air-entraining admixture, and water in accordance with ASTM C 94, Option A, to produce the following properties:
1. Compressive Strength: 3000 psi, minimum at 28 days.
  2. Slump Limits: 3 inches (8 inches after the addition of high-range water-reducing admixture, i.e. super plasticizer).
  3. Air Content: 4 to 8 percent by volume.
  4. Water cement ratio: not more than 0.53 (6 gal. per bag).

## 2.3 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design to Engineer for review prior to commencement of Work.
- B. Provide manufacturer's certification that cement meets all specified requirements.

- C. Sample and test aggregates in accordance with ASTM C33.

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

- A. Remove loose material from compacted sub-base surface immediately before placing concrete.
- B. Proof-roll prepared sub-base surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.
- D. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

### 3.2 FORM CONSTRUCTION

- A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.
- C. Check completed formwork for grade and alignment to following tolerances:
  - 1. Top of forms not more than 1/8 inch in 10 feet.
  - 2. Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.
  - 3. Slope step treads at 1/4 inch per foot to drain.

### 3.3 REINFORCEMENT

- A. Locate, place and support reinforcement as indicated on the construction plans.

### 3.4 CONCRETE PLACEMENT

- A. Do not place concrete until sub-base and forms have been checked for line and grade. Moisten sub-base if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- B. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation.



Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

- C. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- D. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.
- E. Curbs and Gutters: Shall be uniform in appearance and true to grade and cross-section. Any variation will not be permissible if it causes water ponding or alters the direction of flow. Face forms shall be removed as soon as possible and the exposed surfaces finished with a wood float. Straight-edging done along the edge of the gutter and top of curb and median shall conform to those requirements for the adjacent pavement, but with no irregularities to exceed 1/4" in 10 feet.

### 3.5 JOINTS

- A. General: Concrete work shall be jointed as shown on the project drawings. If not indicated on the drawings, a jointing plan shall be prepared by the contractor and approved before paving begins. Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

Joints should be laid out to aid construction and to control cracking. A square panel pattern is preferable but a dimensional ratio of 1-1/2 x 1 is permissible. Joint spacing shall not exceed 10 feet. Place joints to approximate the cracking that would occur without joints. When placing new concrete adjacent to existing or previously placed concrete, align joints with those in the existing or previously placed concrete whenever possible.

- B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:
  - 1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
  - 2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
  - 3. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

- C. Construction Joints: Place construction joints in accordance with the details shown on the drawings at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.
- D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.
  - 1. Vehicular pavement lanes: Transverse expansion joints 50 feet on center, each lane.
  - 2. Sidewalks: Transverse expansion joints 50 feet on center.
  - 3. Curb and gutter: Transverse expansion joints 50 feet on center, coincident with pavement joints.
  - 4. Where sidewalk is placed adjacent to curb and against building structure on other side, place expansion joint between sidewalk and back of curb.
  - 5. Where sidewalk is adjacent to curb, place expansion joint between sidewalk and back of curb at intersection radius returns.
  - 6. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
  - 7. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
  - 8. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

### 3.6 CONCRETE FINISHING

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
- C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.
- D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:
  - 1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Engineer. Finish tool joints and edges to a smooth finish by hand after broom finish is applied.
  - 2. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Engineer.

### 3.7 CURING

- A. Protect and cure finished concrete paving using membrane-forming curing and sealing compound or approved moist-curing methods.
- B. Anti-spalling Treatment: Apply treatment to concrete surfaces no sooner than 28 days after placement, to clean, dry concrete free of oil, dirt, and other foreign material. Apply curing and sealing compound at a maximum coverage rate of 300 s.f. per gallon. Apply anti-spalling compound in 2 sprayed applications. First application at rate of 40 sq. yds. per gal.; second application, 60 sq. yds. per gallon. Allow complete drying between applications.

### 3.8 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete, as directed by Engineer.
- B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

### 3.9 FIELD QUALITY CONTROL

- A. Section 01001 – General Requirements: Testing Laboratory Services
- B. Three concrete test cylinders will be taken for every 100 or less cu yds of concrete placed each day. Test cylinders will be broken at 7 and 28 days with the third cylinder held in reserve and broken at the Engineer's discretion.
- C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- D. One slump test will be taken for each set of test cylinders taken. For concrete containing a high-range water-reducing admixture (super plasticizer), take slump test before the admixture is added at the job site.

- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

END OF SECTION

SECTION 02924  
SEEDING AND MULCHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Seeding and mulching all disturbed areas.
- B. Related Sections:
  - 1. Section 02300: Earthwork
  - 2. Section 02374: Erosion Control

1.2 MEASUREMENT AND PAYMENT

- A. Seed and Mulch:
  - 1. Basis of Measurement: Number of acres seeded and mulched under seeding schedule No. 1.
  - 2. Basis of Payment: Payment will be made at the Unit Price bid for seeding and mulching and shall include all costs for seed, soil amendments, soil preparation, reworking turf seeded under Schedule No. 2, application of soil amendments and seed mixture, application of mulch, watering, maintenance and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.
  - 3. Pay Item;
    - a. Seeding and Mulching
- B. No separate measurement or payment will be made for temporary seeding under seeding schedule No. 2.

1.3 SUBMITTALS

- A. Section 01001 – General Requirements: Submittal Procedures:
- B. Product Data: All items proposed to be provided under this Section.
- C. Manufacturer's Certificate: Certificate of compliance with these Specifications.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

- B. Seed: Conform to all State laws and to all requirements and regulations of the S.C. Department of Agriculture.
  - 1. Deliver to site each variety of seed individually packaged and tagged to show name, net weight, origin and lot number.
- C. Fertilizer: Conform to State fertilizer law.

## PART 2 PRODUCTS

### 2.1 PRODUCT HANDLING

- A. Section 01001: General Requirements: Product Delivery, Handling, Storage
- B. At time of delivery, furnish the Engineer invoices of all materials received in order that application rates may be determined.
- C. Immediately remove from the site materials which do not comply with the specified requirements, and promptly replace with materials meeting the specified requirements.

### 2.2 FERTILIZER

- A. Provide commercial balanced 10-10-10 fertilizer delivered to the site in sealed bags labeled with the manufacturer's guaranteed analysis.

### 2.3 GRASS SEED

- A. Provide grass seed which is:
  - 1. Free from noxious weed seeds, and re-cleaned;
  - 2. Grade A recent crop seed;
  - 3. Treated with appropriate fungicide at time of mixing;
  - 4. Delivered to the site in sealed containers with dealer's guaranteed analysis.

### 2.4 LIME

- A. Provide agricultural grade, standard ground limestone conforming to current "Rules, Regulations and Standards of the Fertilizer Board of Control" issued at Clemson University.
- B. Bag tags or delivery slip for bulk loads shall indicate brand or trade name, calcium carbonate equivalent, and other pertinent data to identify the lime.

### 2.5 EMULSIFIED ASPHALT (ANIONIC)

- A. Grade EA-P Special meeting the requirements of S.C. Highway Department Specifications, Subsection 406.05, Edition of 2000.

- B. If necessary for satisfactory spraying, material may be diluted with water at the manufacturing plant.

## 2.6 WOOD CELLULOSE FIBER

- A. Provide wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer.
- B. Material to be heat processed so as to contain no germination or growth inhibiting factors.
- C. It shall be dyed (non-toxic) an appropriate color to facilitate metering.

## 2.7 STRAW MULCH

- A. Provide straw or hay material.
  - 1. Straw to be stalks of wheat, rye, barley or oats;
  - 2. Hay to be timothy, pea vine, alfalfa, or coastal Bermuda.
- B. Material to be reasonably dry and reasonably free from mature seed bearing stalks, roots, or bulblets or Johnson Grass, Nut grass, Wild Onion and other noxious weeds.

## 2.8 EXCELSIOR FIBER MULCH

- A. To consist of 4 to 6 inches, average length, wood fibers cut from sound, green timber.
- B. Make cut in such a manner as to provide maximum strength of fiber, but at a slight angle to natural grain of the wood.

## PART 3 EXECUTION

### 3.1 GENERAL

- A. Seed following areas immediately upon completion of their construction:
  - 1. Slopes greater than four horizontal to one vertical;
  - 2. Utility rights-of-way adjacent to stream banks.
- B. Areas ready for planting between August 16 and February 28 shall be planted with a temporary cover in accordance with Schedule No. 2. At the acceptable seasons for planting under Schedule No. 1, the turf previously seeded under Schedule No. 2 shall be destroyed by reworking the soil and re-seeded in accordance with Schedule No. 1 as specified herein.

### 3.2 SEEDING SCHEDULES

- A. Mixtures of different types of seed for the various schedules shall be weighed and mixed in proper proportions in the presence of the Engineer.
- B. Schedule No. 1 - Permanent Seeding

#### Permanent Seeding - Coastal

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Sandy, Droughty Sites</b>													
Browntop Millet	10 lbs./ac.												
Bahiagrass	40 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Bahiagrass	30 lbs./ac.												
Sericea Lespedeza	40 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Atlantic Coastal Panicgrass	15 lbs./ac. PLS												
Browntop Millet	10 lbs./ac.												
Switchgrass (Alamo)	8 lbs./ac. PLS												
Little Bluestem	4 lbs./ac.												
Sericea Lespedeza	20 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Weeping Lovegrass	8 lbs./ac.												
<b>Well drained, clayey/loamey Sites</b>													
Browntop Millet	10 lbs./ac.												
Bahiagrass	40 lbs./ac.												
Rye, Grain	10 lbs./ac.												
Bahiagrass	40 lbs./ac.												
Clover, Crimson (Annual)	5 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Bahiagrass	30 lbs./ac.												
Sericea lespedeza	40 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Bermuda, Common	10 lbs./ac.												
Sericea lespedeza	40 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Bermuda, Common	12 lbs./ac.												
Kobe Lespedeza (Annual)	10 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Bahiagrass	20 lbs./ac.												
Bermuda, Common	6 lbs./ac.												
Sericea lespedeza	40 lbs./ac.												
Browntop Millet	10 lbs./ac.												
Switchgrass	8 lbs./ac.												
Little Bluestem	PLS												
Indiangrass	3 lbs./ac. PLS 3 lbs./ac. PLS												



C. Schedule No. 2 - Temporary Seeding

**Temporary Seeding – Coastal**

Species	Lbs./Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Sandy, Droughty Sites</b>													
Browntop Millet	40 lbs./ac.												
Rye, Grain	56 lbs./ac.												
Ryegrass	50 lbs./ac.												
<b>Well drained, clayey/loamey Sites</b>													
Browntop Millet or Japanese Millet	40 lbs./ac.												
Rye, Grain or Oats	56 lbs./ac. 75 lbs./ac.												
Ryegrass	50 lbs./ac.												

3.3 PREPARATION

- A. Bring all areas to proper line, grade and cross section indicated on the plans.
- B. Repair erosion damage prior to commencing seeding operations.
- C. Loosen seed bed to minimum depth of 3 inches.
- D. Remove all roots, clods, stones larger than 2 inches in any dimension, and other debris.

3.4 APPLICATION OF FERTILIZER

- A. Spread uniformly over areas to be seeded at:
  - 1. Rate of 1,000 lbs per acre;
  - 2. Use approved mechanical spreaders.
- B. Mix with soil to depth of approximately 3 inches.

3.5 SEEDING AND MULCHING

- A. General:
  - 1. Perform seeding during the periods and at the rates specified in the seeding schedules;
  - 2. Do not conduct seeding work when ground is frozen or excessively wet;
  - 3. Produce satisfactory stand of grass regardless of period of the year the Work is performed.
- B. Seeding, slopes steeper than four horizontal to one vertical:
  - 1. Conform to Methods EA, WF or WCF as specified hereinafter;

2. Method EA (Emulsified Asphalt):
    - a. Sow seed not more than 24 hours after application of fertilizer;
    - b. Use mechanical seed drills on accessible areas, rotary hand seeders, power sprayers, etc. may be used on steep slopes or areas not accessible to seed drills;
    - c. Cover seed and lightly compact with cultipacker if seed drill does not compact soil;
    - d. Within 24 hours following compaction of seeded areas, uniformly apply 0.2 gallons per square yard of emulsified asphalt over the seeded area.
  3. Method WF (Excelsior Fiber Mulch):
    - a. Sow seed as specified for Method EA.;
    - b. Within 24 hours following covering of seeds, uniformly apply excelsior fiber at the rate of 100 pounds per 1000 square feet;
    - c. Material may be applied hydraulically or dry. If applied dry, it shall be thoroughly wetted immediately following placing;
    - d. Seeded areas to be lightly rolled to form a tight mat of the excelsior fibers.
  4. Method WCF (Wood Fiber Mulch):
    - a. Apply seed, fertilizer and wood fiber mulch using hydraulic equipment;
    - b. Equipment to have built-in agitation system with capacity to agitate, suspend and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed and water;
    - c. Minimum capacity of slurry tank: 1000 gallons;
    - d. Apply fiber mulch at rate of 35 pounds per 1000 sq. ft.;
    - e. Regulate slurry mixture so that amounts and rates of application will result in uniform application of all materials at not less than the specified amounts;
    - f. Apply slurry in a sweeping motion, in an arched stream, so as to fall like rain, allowing the wood fibers to build upon each other;
    - g. Use color of wood pulp as guide, spraying the prepared seed bed until a uniform visible coat is obtained.
- C. Seeding, slopes equal to or flatter than four horizontal to one vertical:
1. Sow seed as specified for Method EA, steps a thru c;
  2. Apply straw or hay mulch at the rate of 100 pounds per 1000 square feet uniformly to the seeded area. Mulch may be applied by hand, by mechanical spreaders, or by blowers;
  3. Hold mulch in place with a tack coat of emulsified asphalt, applied at the rate of 0.2 gallons per square yard.

### 3.6 MAINTENANCE

- A. Maintain all seeded areas in satisfactory condition until final acceptance of the Work.
- B. Areas not showing satisfactory evidence of germination within six weeks of the seeding date shall be immediately reseeded, fertilized and/or mulched.

SECTION 03200  
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Reinforcing bars.
  - 2. Welded wire fabric.
  - 3. Reinforcement accessories.
- B. Related Sections:
  - 1. Section 03300 - Cast-in-Place Concrete.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Reinforcing Steel:
  - 1. Basis of Measurement: No separate measurement of reinforcing steel will be made.
  - 2. Basis of Payment: No separate payment will be made for reinforcing steel. All costs for furnishing and placing reinforcing steel shall be included in the lump sum price bid for the structure in which the reinforcing steel is placed and shall include all costs for furnishing, transporting, fabricating, placing, and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.

1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - 2. A185-02 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
  - 3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  - 4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 5. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
- B. Concrete Reinforcing Steel Institute:
  - 1. CRSI - Manual of Standard Practice.

#### 1.4 SUBMITTALS

- A. Section 01001 – General Requirements: Submittal Procedures.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- C. Submit certified copies of mill test report of reinforcement materials analysis.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with CRSI - Manual of Standard Practice.

#### 1.6 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

### PART 2 PRODUCTS

#### 2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished unless otherwise called for on the plans.
- B. Galvanized Reinforcing Steel: Where called for on the plans, reinforcing steel shall be galvanized in accordance with ASTM A767/A767M, Class II.
- C. Stirrups Steel: ASTM A82, unfinished unless otherwise called for on the plans.
- D. Welded Steel Wire Fabric: ASTM A497 Deformed Type or ASTM A185 Plain type; unfinished.

#### 2.2 ACCESSORY MATERIALS

- A. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.
- B. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: type; size and shape to meet Project conditions.
- C. Reinforcing Splicing Devices: As called for on the plans.

#### 2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.

## PART 3 EXECUTION

### 3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor retarder.
- C. Accommodate placement of formed openings.
- D. Splice reinforcing where indicated on Drawings in accordance with splicing device manufacturer's instructions.

END OF SECTION

- C. Repair any eroded areas.
- D. Mow as necessary to maintain healthy growth rate until final acceptance of the Work.

### 3.7 ACCEPTANCE

- A. Permanently seeded areas under Schedule No. 1 will be accepted when the grass attains a height of two inches.
- B. No acceptance will be made of temporary seeded areas under Schedule No. 2. Re-work and re-seed those areas in accordance with Schedule No. 1.

END OF SECTION

SECTION 03300  
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
  - 1. Foundation walls.
  - 2. Supported slabs.
  - 3. Slabs on grade.
  - 4. Equipment pads.
  - 5. Thrust blocks.
  - 6. Headwalls
  - 7. Concrete Encasement
  
- B. Work included in this section:
  - 1. Concrete, cast-in-place
  - 2. Forms and accessories
  - 3. Concrete reinforcement
  - 4. Concrete finishing
  - 5. Concrete curing
  
- C. Related Sections:
  - 1. Section 02750-Portland Cement Concrete Pavement, Sidewalks, curbs and gutters.

1.2 MEASUREMENT AND PAYMENT

- A. Portland Cement Concrete, In Place:
  - 1. Basis of Measurement: No separate measurement of cast-in-place concrete will be made.
  - 2. Basis of Payment: No separate payment will be made for cast-in-place concrete. All costs for furnishing and placing cast-in-place concrete shall be included in the lump sum price bid for the structure in which the concrete is placed and shall include all costs for furnishing, transporting, placing, forming, finishing and all other costs of whatever nature required for performance of this item of Work under this section of the Specifications.

1.3 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete for Buildings.
  - 2. ACI 305 - Hot Weather Concreting.
  - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
  - 4. ACI 308 - Guide to Curing Concrete

- B. Concrete Reinforcing Steel Institute
  - 1. CRSI Manual of Practice
  
- C. American Society for Testing and Materials International:
  - 1. ASTM A497/A 497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
  - 2. ASTM A615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - 3. ASTM A704/A 704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
  - 4. ASTM A767/A 767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
  - 5. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 7. ASTM C150 - Standard Specification for Portland Cement.
  - 8. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 9. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  - 10. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
  - 11. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 12. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - 13. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  - 14. ASTM D98 - Standard Specification for Calcium Chloride
  - 15. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - 16. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
  - 17. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
  
- D. American Welding Society
  - 1. Structural Welding Code – Reinforcing Steel

#### 1.4 SUBMITTALS

- A. Section 01001 – General Requirements: Submittal Procedures.
- B. Product Data: Submit data on admixtures, joint devices, joint filler and sealer.
- C. Design Data:



1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
    - a. Hot and cold weather concrete work.
    - b. Air entrained concrete work.
  2. Identify mix ingredients and proportions, including admixtures.
- D. Manufacturer's certification: Certify products meet or exceed specified requirements.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01001 – General Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Use cement and aggregate from one source for all Work under this contract.
- C. Conform to ACI 305 when concreting during hot weather.
- D. Conform to ACI 306.1 when concreting during cold weather.

#### 1.7 COORDINATION

- A. Section 01001 – General Requirements: Coordination.
- B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

### PART 2 PRODUCTS

#### 2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type II – Moderate unless specifically indicated otherwise on the drawings or in Special Provisions.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

#### 2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260.

- B. Chemical: ASTM C494 Type A - Water Reducing, Type C – Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating, Type F - Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding.
  - 1. Type B is not allowed.
- C. Fly Ash: ASTM C618 Class C or F.
- D. Plasticizer: ASTM C1017.

2.3 CALCIUM CHLORIDE

- A. ASTM D98, Type S or Type L.
- B. May be used for cold weather work in un-reinforced concrete only. Calcium Chloride shall not be used in reinforced concrete structures or in any concrete, reinforced or un-reinforced, that is in contact with ferrous metal.

2.4 ACCESSORIES

- A. Vapor Barrier: ASTM E1745 Class A; 15 mil thick clear polyethylene film; type recommended for below grade application. Furnish joint tape recommended by manufacturer.
- B. Non-Shrink Grout: ASTM C1107, Grade B or C, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.5 JOINT FILLER MATERIALS

- A. Expansion Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

2.6 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94, Option C.
- B. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.
- C. Provide concrete to the following criteria:

Concrete class Designation	28-day Compressive Strength
2500	2500 psi
3000	3000 psi
4000	4000 psi
5000	5000 psi

- D. Slump: 1 inch to 4-inches, before the addition of high range water reducing admixtures.
- E. Entrained Air: 4 1/2%, plus or minus 1 1/2%.
- F. Admixtures: The contractor is responsible for obtaining the desired consistency of the concrete. The addition of pozzolans and /or admixtures may be necessary to obtain the appropriate workability and consistency. The Contractor is responsible for providing additional pozzolans or admixtures as necessary at no additional cost.
  - 1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
  - 2. Use set retarding admixtures during hot weather.
  - 3. Add air entraining agent to normal weight concrete mix for work exposed to exterior.
  - 4. Type F and Type G admixtures are added at the job site just before discharge. The slump of the concrete shall be measured before the addition of these high range admixtures and shall not exceed the maximum limit specified.

## 2.7 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor.
- B. Lumber Forms:
  - 1. Application: Use for edge forms and unexposed finish concrete.
  - 2. Boards: 6 inches or 8 inches in width, shiplapped or tongue and groove, "Standard" Grade Spruce, Pine or Fir. Surface boards on four sides.
- C. Plywood Forms:
  - 1. Application: Use for exposed finish concrete.
  - 2. Forms: Conform to PS 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of APA/EWA.
  - 3. Plywood for Surfaces to Receive Membrane Waterproofing: Minimum of 5/8 inch thick; APA/EWA "B-B Plyform Structural I Exterior" grade.
  - 4. Plywood where "Smooth Finish" is required, as indicated on Drawings: APA/EWA "HD Overlay Plyform Structural I Exterior" grade, minimum of 3/4 inch thick.

## 2.8 PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

- C. Pan Type: Steel of size and profile required.
- D. Tubular Column Type: Round, spirally wound laminated fiber, wood, or glass fiber material, surface treated with release agent, non-reusable, sizes as indicated on Drawings
- E. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set.
- F. Steel Forms: Sheet steel, suitably reinforced, and designed for particular use indicated on Drawings.

2.9 FRAMING, STUDDING AND BRACING: Stud or No. 3 structural light framing grade.

2.10 FORM LINERS: Smooth, durable, grainless and non-staining hardboard, unless otherwise indicated on Drawings.

- A. Architectural Form Liners: Polystyrene, Acrylonitrile butadiene styrene (ABS) or Polyurethane; single use or reusable; pattern as indicated on Drawings.

2.11 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, galvanized metal, adjustable length, cone type, 3/4 inch back break dimension, free of defects capable of leaving holes larger than 1 inch in concrete surface.
- B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- C. Form Anchors and Hangers:
  1. Do not use anchors and hangers for exposed concrete leaving exposed metal at concrete surface.
  2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
  3. Penetration of structural steel members is not permitted.
- D. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
- E. Corners: Fillet and Chamfer, rigid plastic or wood strip, maximum possible lengths.
- F. Vapor Retarder: Where indicated on Drawings, 8 mil thick polyethylene sheet.
- G. Bituminous Joint Filler: ASTM D1751.

- H. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.
- I. Water Stops: Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, 6 inch nominal width, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

## 2.12 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished.
- B. Where indicated on the plans use hot dip galvanized reinforcing bars in accordance with ASTM A767/A767M, Class II finish, minimum thickness of 3.5 mils.
- C. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704/A704M, ASTM A615/A615M, Grade 60, steel bars or rods, unfinished.
- D. Steel Welded Wire Reinforcement: ASTM A497 Deformed Type, galvanized.

## 2.13 REINFORCING ACCESSORY MATERIALS

- A. Tie Wire: Epoxy coated
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture where applicable.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic or plastic-coated steel, type; size and shape to meet Project conditions.
- D. Reinforcing Splicing Devices:
  - 1. Welded splices:
    - a. Use only where shown on the plans or with written approval of the Engineer.
    - b. Conform to AWS D1.4
    - c. Lap weld: Use low hydrogen type electrodes.
    - d. Exothermic welding type: Full tension and compression; sized to fit joined reinforcing.
    - e. Repair hot dip galvanized welded reinforcing with a zinc rich formulation approved by the Engineer.
  - 2. Mechanical splices: Threaded type; full tension and compression; sized to fit joined reinforcing.

## 2.14 CURING MATERIALS

- A. Membrane Curing Compound: ASTM C309 Type 2, Class A.

## PART 3 EXECUTION

### 3.1 FORM ERECTION

- A. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- B. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.
- C. Earth Forms:
  - 1. Trench earth forms neatly and accurately.
  - 2. Trim sides and bottom of earth forms.
  - 3. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.
  - 4. Form sides of footings where earth sloughs.
  - 5. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.
- D. Formwork - General:
  - 1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
  - 2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
  - 3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
  - 4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
  - 5. Complete wedging and bracing before placing concrete.
- E. Forms for Smooth Finish Concrete:
  - 1. Use steel, plywood or lined board forms.
  - 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
  - 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
  - 4. Use full size sheets of form lines and plywood wherever possible.
  - 5. Tape joints to prevent protrusions in concrete.
  - 6. Use care in forming and stripping wood forms to protect corners and edges.

7. Level and continue horizontal joints.
  8. Keep wood forms wet until stripped.
- F. Architectural Form Liners:
1. Erect architectural side of formwork first.
  2. Attach form liner to forms before installing form ties.
  3. Install form liners square, with joints and pattern aligned.
  4. Seal form liner joints to prevent grout leaks.
  5. Dress joints and edges to match form liner pattern and texture.
- G. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.
- H. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
  2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
  3. Construct beam soffits of material minimum of 2 inches thick.
  4. Distribute bracing loads over base area on which bracing is erected.
  5. When placed on ground, protect against undermining, settlement or accidental impact.
- I. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- J. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- K. Obtain Architect/Engineer's approval before framing openings in structural members not indicated on Drawings.
- L. Install fillet and chamfer strips where indicated on the Drawings.
- M. Install void forms, when required, in accordance with manufacturer's recommendations.

### 3.2 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces are indicated to receive [special finishes] [or] [applied coverings] that are affected by agent. Soak

inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

- D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

### 3.3 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.
- B. Locate and set in place items required to be cast directly into concrete.
- C. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- D. Install water stops continuous without displacing reinforcement. Heat seal joints watertight.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- G. Form Ties:
  - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
  - 2. Place ties at least 1 inch away from finished surface of concrete.
  - 3. Leave inner rods in concrete when forms are stripped.
  - 4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
- H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- I. Construction Joints:
  - 1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
  - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
  - 3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
  - 4. Arrange joints in continuous line straight, true and sharp.



- J. Embedded Items:
  - 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
  - 2. Do not embed wood or uncoated aluminum in concrete.
  - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.
  - 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
  - 5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318, Section 6.3.
  
- K. Openings for Items Passing Through Concrete:
  - 1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
  - 2. Coordinate work to avoid cutting and patching of concrete after placement.
  - 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
  
- L. Screeds:
  - 1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
  - 2. Slope slabs to drain where required or as shown on Drawings.
  - 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.
  
- M. Screenshot Supports:
  - 1. For concrete over waterproof membranes and vapor barrier membranes, use cradle, pad or base type screed supports which will not puncture membrane.
  - 2. Staking through membrane is not permitted.
  
- N. Cleanouts and Access Panels:
  - 1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
  - 2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

### 3.4 FORM REMOVAL

- A. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
  
- B. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

### 3.5 FORM ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.
- B. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.
- C. Camber slabs and beams in accordance with ACI 301.

### 3.6 REINFORCING FABRICATION AND PLACEMENT

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.
- B. Locate reinforcement splices not indicated on Drawings, at point of minimum stress.
- C. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- D. Use bar supports to position and support layers of reinforcing steel in slabs and beams.
- E. Do not displace or damage vapor retarder.
- F. Accommodate placement of formed openings.
- G. Unless otherwise indicated on the Drawings, maintain concrete cover around reinforcement as follows:

<u>Item</u>	<u>Cover</u>
Beams	1 1/2 inch
Supported Slabs and Joists	3/4 inch
Column Ties	1 inch
Walls (exposed to weather or backfill)	2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	3 inch

### 3.7 PLACING CONCRETE

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

- C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- D. Place concrete in accordance with ACI 301.
- E. Notify Engineer minimum 24 hours prior to commencement of concrete placement operations.
- F. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- G. Install vapor barrier under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by taping edges and ends.
- H. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.
- I. Separate slabs on grade from vertical surfaces with 1/4 inch thick joint filler.
- J. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface. Place floor slabs in sequence indicated on the Drawings.
- K. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.]
- L. Screed floors and slabs on grade level, maintaining surface flatness tolerance of 1/4 inch maximum in 10 ft.

### 3.8 CONCRETE FINISHING

- A. Provide formed concrete surfaces to be left exposed with sack rubbed finish.
- B. Finish concrete floor surfaces in accordance with ACI 301.
- C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot nominal or as indicated on drawings.

### 3.9 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Cure floor surfaces in accordance with ACI 308.
- C. Membrane Curing Compound: Apply curing compound in one coat.

### 3.10 PROTECTION OF FINISHED WORK

- A. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- B. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Engineer.
- C. Do not permit traffic over unprotected floor surface.

### 3.11 FIELD QUALITY CONTROL

- A. Section 01001- General Requirements: Quality Control; Testing Laboratory Services.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- C. Notify Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- D. Schedule concrete placement to permit formwork inspection before placing concrete.
- E. Field testing will be performed in accordance with ACI 301.
- F. Provide free access to Work and cooperate with appointed testing laboratory.
- G. Submit proposed mix design of each class of concrete to testing laboratory for review prior to commencement of Work.
- H. Three concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed each day.
- I. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
- J. One slump measurement will be taken for each set of test cylinders taken and one measurement for each truck load delivered to the site.
- K. One air content test will be made for each set of test cylinders taken.
- L. Maintain records of concrete placement. Record date, location, quantity, air temperature, test samples taken and slump measurements taken.

### 3.12 PATCHING

- A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- C. Patch imperfections, including form tie holes, as directed by Engineer in accordance with ACI 301.

### 3.13 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements for quality.
- B. Repair or replacement of defective concrete will be determined by Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION