



**STANDARD SPECIFICATIONS
FOR
WATER LINE CONSTRUCTION**

**SCDHEC Approved November 10, 2016
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Standard Details

Article I. General

No water mains, water services, or appurtenances shall be installed within the District except in conformance with these standards, except as specifically herein provided. The following specifications apply to all water mains and services installed on public or private property that are connected or intended to be connected directly or indirectly to the Chester Metropolitan District's water system. All plans and specifications for such water mains and appurtenances to be owned by the District, shall be reviewed and approved in writing by the District prior to construction. The installation of all water mains and appurtenances to be owned by the District, shall also be approved by the District.

The District shall also review and approve private water systems to ensure compliance with the District's policies. These additional private systems include, but are not limited to: fire protection piping outside of buildings, booster pumps including fire pumps, connections to District owned facilities or to backflow preventers connected to District owned facilities, and other situations that have a potential to impact the District.

Section 1.01 Definitions and Abbreviations

As used in these specifications, the following words are defined:

- a. District - shall mean the Chester Metropolitan District. Whenever the words "ordered," "directed," "required," "approved," or "accepted" or variations thereof are used, they shall refer to action by the Water Board, its Chairman, District Engineer, or their designated representative(s), unless otherwise specified.
- b. Engineer - shall mean the licensed engineer, architect, or surveyor who is employed by the Owner to design the water distribution system and review material submittals.
- c. Contractor - shall mean the party who is employed by the Owner to construct the water distribution system.
- d. ANSI - American National Standards Institute
- e. AWWA - American Water Works Association
- f. ASTM - American Society for Testing and Material
- g. NSF - National Sanitation Foundation
- h. SCDDDES - South Carolina Department of Environmental Services
- i. SCDOT – South Carolina Department of Transportation
- j. AASHTO – American Association of State Highway and Transportation Officials
- k. OSHA – Occupational Safety and Health Administration

Section 1.02 Codes and Standards

Codes and Standards established by the following agencies and publications shall be held to be a part of this specification. All codes and regulations shall be the latest approved edition.

- a. American National Standards Institute
- b. American Water Works Association
- c. American Society for Testing and Materials

- d. National Sanitation Foundation
- e. SCDOT Standard Specifications for Highway Construction
- f. AASHTO (Ref 01100 05. D 3., Ref 02300 03.B.)
- g. SCDES, Bureau of Water, SCR.61-9, SCR. 61-58, SCR72. Article II, SCR72. Article III, and SCR72. Article IV
- h. Occupational Safety and Health Administration

Article II. Materials

Section 2.01 Waterline General Requirements

All piping to include valves and fittings shall be of the type and size as shown on the drawings or specified in other sections. Materials are to be of standard manufacturer meeting all requirements of applicable ASTM standards. Materials not specifically covered by and meeting ASTM, AWWA, and ANSI/NSF shall not be used. All pipe material, solder and flux shall be lead free (less than 0.2% lead in solder and flux and a weighted average of 0.25% for pipes and fittings) in accordance with Section 1417 of the "Safe Drinking Water Act."

All valves and fittings 4-inches and greater installed above ground or inside vaults or other structures (manholes, enclosures, etc.) shall be flanged, AWWA C110, unless otherwise noted. All valves 4-inches and larger installed below ground shall be mechanical joint and have a valve box. If installed outside of paved areas, a concrete valve doughnut shall be used.

If applicable, valves, valve boxes, hydrants, and meters shall comply with the American Iron and Steel provision when funding is provided by Clean Water State Revolving Fund (CWSRF) or Drinking Water State Revolving Fund (DWSRF).

Water mains 12-inches and larger shall be ductile iron unless otherwise directed by the District. All hydrant legs shall be ductile iron.

Natural rubber or other material which will support microbiological growth may not be used for any gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to the water. Rubber gaskets shall be **SBR**, unless otherwise directed, and conform to AWWA Standard C111. Lubricants which will support microbiological growth shall not be used for slip-on joints. Vegetable shortening shall not be used to lubricate joints.

The following pipe sizes shall not be specified or installed and will not be accepted by the District: 1.25-inch, 2.5-inch, or 3-inch. Solvent-weld PVC pipe and fittings shall not be used in water mains two (2) inches and larger.

(a) Shop Drawings

Shop drawings shall be submitted on all pipe, fittings, valves, sleeves, couplings, supports, and appurtenances required for complete installation of the water line. Where material being utilized is the same as specified, the Contractor shall submit shop drawings to the Engineer and a verification statement that all piping is as specified.

Section 2.02 Ductile Iron Pipe and Fittings

(a) Pipe:

Ductile iron pipe shall conform with AWWA Standard C151. Pipe shall be Pressure Class 350 (PC350), unless otherwise noted. Underground pipe shall have push on or mechanical joints. Above ground or visible pipe shall have flanged joints. Pipe shall be coated on the outside with 1 mil minimum thickness of

bituminous coating. The interior surface of pipe shall be lined with cement mortar conforming to AWWA Standard C104, standard thickness.

(b) Fittings

Fittings for all piping, including PVC, shall be ductile iron. 3-inch to 24-inch ductile iron fittings shall be Pressure Class 350 (PC350) and 30-inch to 48-inch shall be Pressure Class 250 (PC250) in conformance with AWWA Standard C153 or C110. The interior surface of pipe shall be lined with cement mortar conforming to AWWA Standard C104, standard thickness. All fittings shall be suitable for use with both Ductile Iron and PVC pipe. Transition gaskets are to be provided, when necessary, to connect ductile iron fittings with PVC piping (non-C900/C905).

(c) Restrained Joints

A restrained joint is a special type of push-on or mechanical joint that is designed to provide longitudinal restraint. Restrained joint systems function in a manner similar to thrust blocks, insofar as the reaction of the entire restrained unit of piping with soil balances the thrust force.

Mechanical restrained joints shall meet the applicable requirements of AWWA Standard C111. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The joint restraint ring and its wedging components shall be made of ductile iron conforming to ASTM A536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to AWWA Standard C111 and AWWA Standard C153. Torque limiting twist off nuts shall be used to insure proper actuation of the restraining wedges.

Flexible, push-on restrained joints shall meet the applicable requirements of AWWA Standard C111. Gaskets with vulcanized internal stainless steel locking segments may be used for 4-inch through 24-inch Ductile Iron Pipe. Only designs using a welded retainer ring on the spigot will be allowed for 30-inch and larger diameter pipe.

Section 2.03 Polyvinyl Chloride (PVC) Pipe and Fittings

(a) Pipe

PVC pipe shall conform to ASTM Standard D2241 (PVC 1120), AWWA Standard C900, or AWWA Standard C905 and shall bear the seal of the National Sanitation Foundation. Water line piping 4-inches to 8-inches shall be PC305 (DR14) per AWWA Standard C900 and water line piping 14-inches to 48-inches shall be PC235 (DR18) per AWWA Standard C905. Water line piping 2-inches and smaller shall be PR315 (SDR 13.5) per ASTM Standard D2241 as directed by the District. PVC pipe shall be made from white or blue pigmented materials and furnished in a length of 20 feet. Lesser lengths will be accepted to allow the proper placement of fittings, valves, etc.

(b) Fittings

Fittings for PVC piping shall be mechanical joint ductile iron fittings.

(c) Restrained Joints

Knuckle joint restraint shall have a one-piece grip ring residing within a ductile iron housing having machined serrations and shall be activated by one bolt. The housing and grip ring shall be of ductile iron to ASTM A536. Bolt and nut shall be Type 304 stainless steel (or approved equal).

Mechanical restrained joints shall meet the applicable requirements of AWWA Standard C110. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The joint restraint ring and its wedging components shall be

made of ductile iron conforming to ASTM Standard A536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to AWWA Standard C111 and AWWA Standard C153. Torque limiting twist off nuts shall be used to insure proper actuation of the restraining wedges.

Section 2.04 Polyethylene (PE) Pipe, Tubing, and Fittings

(a) Pipe

PE pipe shall conform to ASTM Standard D3350, ASTM Standard D2239, AWWA Standard C901, and shall bear the seal of the National Sanitation Foundation. PE pipe shall be made from blue pigmented colors.

Water line piping ¾-inch to 2-inch shall be IPS, SDR 7 with a 250-psi pressure rating.

(b) Fittings

¾-inch and 1-inch tubing shall fit Mueller Insta-Tite IPS fittings or Ford Ultra-Tite IPS fittings.

2-inch pipe fittings shall be pack joint type.

Section 2.05 Tracer Wire

Tracer wire shall be a continuous 12-gauge solid copper or copper clad steel wire. The tracer wire jacket shall be blue in color and be approved by the manufacturer for direct burial. Direct burial jackets and coatings include: High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE). Stranded wire is not acceptable.

Connectors shall be dielectric silicon filled to seal out moisture and corrosion and shall be installed in a manner to prevent any uninsulated wire exposure. Non-locking friction fit, twist on, or taped connectors are prohibited. Do not twist wires together and wrap with electrical tape.

Tracer wire must be properly grounded at all dead ends/stubs. Grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 5ft of 12-gauge, red, copper clad steel tracer wire connected to anode (minimum 1.5 lb.) specifically manufactured for this purpose.

Section 2.06 Valves

Valves shall be provided as shown on the drawing and as specified herein. All valves shall open counter-clockwise, have open and close direction indicator, and 2-inch operating nut. Provide and install a stem extension for all valves where the operating nut is 60-inches or greater below the finished grade.

All valves 12-inches and larger shall be butterfly type valves.

(a) Gate Valves

Gate valves shall be the Resilient Wedge type manufactured and tested in accordance with the requirements of AWWA Standard C509/C515. Valves shall be non-rising stem unless otherwise noted. All valves shall have a minimum design working pressure of 250 psig and a test pressure of 500 psig. All valves installed below ground shall be equipped with a valve box over the operating nut. The gate shall be fully encapsulated in molded rubber with no exposed iron. The valves shall be equipped with Buna-N o-rings, a high strength bronze stem, cast iron operating nut, and mechanical joint connections.

Valves shall be manufactured by Mueller, American, or as approved by the District.

(b) Butterfly Valves

Butterfly valves shall be Class 150B, tight closing, rubber seat type. No metal-to-metal seating surfaces will be allowed. Butterfly valves shall meet the requirements of AWWA Standard C504. Valve disc edges shall be stainless steel per ASTM A743. Valve shaft shall be 304 stainless steel per ASTM A276. Valves shall have a cast iron operating nut and mechanical joints.

Valves shall be manufactured by Mueller, DeZurik, Kennedy, or as approved by the District.

(c) Ball Valves

¾-inch and 1-inch ball corporation valves shall be bronze and conform to AWWA Standard C800 with AWWA taper threaded (CC thread) inlet. The outlet shall have copper flare connection and accept Ultra-tite or Insta-tite connection for use with IPS SIDR 7, 250 PSI, polyethylene tubing/coil pipe. Ford FB600-3-NL or Mueller B-25005N

¾-inch and 1-inch ball curb stop valves shall be bronze and conform to AWWA Standard C800 with FIP inlet and outlet and include handle. Valve size shall be the same as the inlet and outlet size. Ford B11-XXX-HB-34-NL or Mueller B-2028303N

2-inch ball curb stop valves shall be bronze and conform to AWWA Standard C800 with FIP inlet and outlet with 2-inch square nut adapter. Mueller B-20200N and AYM26122, Ford B11-777-QT67-NL, or AY McDonald 76101 and 6122

Ball valves shall have a water pressure rating of 200 psi.

(d) Check Valves

Check valves shall be the swing type manufactured and tested in accordance with the requirements of AWWA Standard C508. Check valves larger than 4-inches shall have an outside spring and lever, iron body, and shall be bronze mounted, full opening, and minimum working pressures of 150 psi. Check valves 2-inches and smaller shall be all brass type with threaded NPT connections.

(e) Air or Combination Relief Valves

Air relief valves shall be provided in accordance with required sound engineering practice at high points in water mains as required. All air relief valves shall be provided in conformance with AWWA C512. The air relief valve shall automatically exhaust large volumes of air from the system when it is being filled. The water main shall be installed at a grade which will allow the air to migrate to a high point where the air can be released through an air valve.

Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

The air relief valve shall be sized by the Engineer and approved by the District. The valve shall have a minimum one (1) inch NPT inlet and the inlet body shall be rated for minimum 200 PSI working pressure. Valves three (3) inches and larger shall have flanged connections. Float balls and guides shall be stainless steel.

The air relief valve shall be installed as shown in the detail drawings. All air relief valve assemblies shall be provided with a tapping saddle in the same sizing as the air relief valve assembly and isolated with a gate valve of the same size. The isolation gate valve shall be provided with NPT threads. Brass or bronze ball valves may be used in lieu of gate valves for installations 2-inches or smaller. The isolation valve shall be rated for 200-psi service or greater.

Section 2.07 Valve Boxes

Valve boxes shall be traffic rated, cast iron, designed for use in roads, driveways, and other areas experiencing heavy traffic. Valve boxes shall consist of a base, top section, and lid. Center sections shall be used as required. Valve boxes shall have an asphaltic coating. Lid shall be close fitting and have the letter "W" or the word "Water" cast in the top. Valve box shall not contact the water line and shall be supported by concrete blocks or bricks.

Valve boxes located in landscaped or grassed areas shall have a concrete protection donut.

Section 2.08 Valve Markers

Valve markers shall be installed at each valve located at infrequently maintained sections of road right-of-way, outside the road right-of-way, or other locations as directed by the District. Location shall be approved by the District prior to installation. Markers shall project a minimum of 48-inches above the finished grade. Markers shall be a minimum of 3.5-inches wide. The marker shall be capable of simple, permanent installation by a single person using a manual driving tool. The marker, upon proper installation shall resist displacement from wind, vehicle, and livestock impact forces.

Fiberglass composite marker shall be a single piece, with double-sided print. The bottom end of the marker shall be pointed for ease of ground penetration. The marker will be constructed of a durable, UV resistant, continuous glass fiber reinforced, thermosetting composite material which is resistant to impact, ozone, and hydrocarbons. The marker shall be designed to bend underneath the form of most cars and flex back undamaged into its upright position. The marker shall be blue and pigmented throughout the entire-cross section as to produce a uniform color, which is an integral part of the material. UV-resistant materials shall be incorporated in the construction to inhibit fading or cracking of the delineator upon field exposure.

Decal shall have the following verbiage: "Caution Water Valve in this vicinity. Before excavating or in emergency call 803-385-5123." The decal shall also have the "no dig" symbol, 811 decal, and the "One-Call" number.

Section 2.09 Hydrants

Fire hydrants shall meet the requirements of AWWA Standard C502 and be self-draining and non-freezing. Three-way hydrants with two 2-1/2 inch and one 5-inch Storz nozzles are to be used only in locations approved by the District. Hydrants shall have traffic flange to prevent damage. All hydrants shall be counterclockwise on, clockwise off. Hydrant shall have a center stem compression type hydrant which opens against the pressure and closes with the pressure. Hydrant body shall be all cast iron or ductile iron with 6-inch mechanical joint connecting shoe, glands, gasket, and bolts with 5-1/4 inch barrel. Hydrant shall be furnished for a bury depth of 42-inches unless otherwise specified. Valve seat ring shall be brass. Fire hydrant shall be rated for 250 psi working pressure and 500 psi test pressure. Hydrants shall be provided with 6" hydrant lead, valve, valve anchoring tee, concrete blocking, wash stone drain, and joint restraint. Hydrant shall be red in color.

Hydrants shall be Mueller Super Centurion, American Darling, or approved equal.

(a) Post Hydrants

Post hydrants shall meet all applicable requirements of AWWA Standard C502 and be self-draining and non-freezing with a single 2-1/2-inch nozzle. Hydrant shoe shall be 2-inch maximum diameter for connection to a 2-inch line and valve. Fire hydrant shall be rated for 150 psi working pressure and 300 psi test pressure. Hydrant shall open by turning in a counterclockwise direction.

Post hydrants shall be manufactured by Mueller or approved equal.

Section 2.10 Tapping Sleeves

Tapping sleeves shall be suitable for tapping all types of pipe manufactured and shall be stainless-steel and conform to AWWA Standard C223. The tapping sleeve shall have a full circle ductile iron or stainless-steel flange and conform to ANSI B16.1, Class 125 and 150 drillings and be recessed to accept a tapping valve. Tapping sleeves must be pressure tested and the test verified by a District representative prior to tapping the water main. Tapping sleeve shall include a test plug. Test Plug shall be ¾" NPT, stainless steel per ASTM A240 Type 304 with standard square head.

Section 2.11 Tapping Saddles

Tapping Saddles shall be suitable for tapping water pipe 2-inches and larger providing a watertight seal. Tapping saddles shall be made of bronze and have stainless steel straps. U bolts are not acceptable. All line sizes shall use tapping saddles only. Direct tapping shall NOT be allowed.

Tapping saddles shall be Smith-Blair, Mueller, Ford, AY McDonald, Romac, or approved equal.

Section 2.12 Meter Assembly (¾" & 1")

(a) Meter Box

Meter box shall be a Ford LYL111-233-REC-T-NL for ¾" size. 1" boxes shall be Ford FLYLBB111-444-T-NL for residential and Ford YL111-444-T-NL for commercial application. Meter box shall have a cast iron base and a cast iron lid section with a 2-inch recessed hole to accept a electronic-read pad. Meter boxes shall be suitable for installation of a standard cast/ductile iron meter box extension. Meter box extensions/risers shall fit snugly in the meter box base for the purpose of raising the overall height of the meter box.

(b) Water Meter

Water meters shall be Sensus iPerl or approved equal. Water meters shall include a radio transceiver that serves as a walk-by, drive-by, or fixed-point endpoint. Water meters shall be compatible with the Sensus FlexNet communications system.

A curb stop ball valve with handle shall be connected to a 5-inch nipple on the outlet side of the meter box. A valve box with lid is to be placed for operation of the valve. Valve box at the outlet of the meter box shall be NDS D109-GL or as approved by the District.

Section 2.13 Cross Connection Control Devices

Residential services shall have a dual check valve installed on the outlet side of the water meter. The dual check valve shall comply with AWWA Standard C510.

Commercial services shall have a testable backflow device in an above ground enclosure. The backflow device shall be on the SC Cross Connection Control list of approved devices and approved by the District.

Section 2.14 Bore and Encasement

The carrier pipe shall be ductile iron pipe on all highway and railroad bores. Encasement pipe shall be welded or seamless steel pipe manufactured in accordance with ASTM A53 or ASTM A139. Encasement piping beneath railroads shall be fully welded around the circumference. Pipe size and minimal wall thickness shall be as follows:

Carrier Pipe Nominal I.D.	Casing Pipe Minimum I.D.	Minimum Wall Thickness
3"	12"	0.250"
6"	14"	0.250"
8"	18"	0.312"
10"	20"	0.344"
12"	22"	0.344"
14"	24"	0.375"
16"	26"	0.406"
18"	28"	0.438"
20"	30"	0.469"

(a) Encasement Spacers (Spiders)

Factory manufactured casing spacers shall be installed on all carrier pipes passing through a casing pipe. Wooden skids will *NOT* be allowed as an alternative.

Encasement spacers shall be bolt-on style with a shell made of at least two halves. The band material shall be manufactured of a minimum 14-gauge, T-304 stainless steel and 10-gauge, T-304 stainless steel risers when needed. The bearing surfaces shall be manufactured of high abrasion resistant and low co-efficient of friction, glass reinforced polymer. The casing spacers shall have a flexible PVC or EPDM liner having a minimum thickness of 0.090". All welds are to be chemically passivated and all hardware to be stainless steel. Encasement spacers shall be configured in a "centered, restrained" method unless otherwise directed by the District. Installation and spacing shall be in accordance with the manufacturer's recommendations.

(b) End Seals

Encasement end seal shall be manufactured of 1/8-inch thick, synthetic rubber, assuring chemical resistance and resiliency. Bands shall be ½-inch wide, T304 stainless steel bandings with 100% non-magnetic worm gear mechanism. Encasement end seal shall have butyl mastic strips to seal edges and be designed to facilitate installation when the carrier line has already been joined together and the installation is complete.

Section 2.15 Erosion Control

The provisions and standards of Chester County and South Carolina DHEC shall be strictly adhered to. Sediment and erosion control measures shall be installed as shown on the construction drawings. Erosion and sediment control measures are to be initiated at the beginning of the construction and maintained throughout the duration of the project. Contractor is to provide additional erosion control measures as site conditions warrant.

(a) Seeding

The Contractor shall adapt his operations to variations in the weather, seasons of the year, and soil conditions as necessary for the establishment of temporary and permanent grass cover. Before acceptance and final payment is made for the grassing work, complete and full coverage of all areas to be grassed shall be obtained. All eroded areas are to be filled, reseeded, and completely covered with grass. Areas where surface drainage has been channelized and washing is evident, shall be re-graded, stabilized with biodegradable erosion control matting, secured with stakes in accordance with the manufacturer's recommendations, and re-seeded.

Before acceptance of the seeding performed for the establishment of permanent vegetation, produce a uniform perennial vegetative cover with a density of 70% of the seeded area. Ensure that the root system is developed sufficiently to survive dry periods and winter weather and is capable of reestablishment in the spring.

(i) Fertilizer and Soil Amendments

Use slow-release granular fertilizer for all permanent cover applications that complies with state fertilizer laws. In a mixed fertilizer such as 10-10-10, the first number represents the percent of nitrogen required, the second number represents the percent of available phosphoric acid required, and the third number represents the percent of water-soluble potash required in the fertilizer.

Use fertilizer that incorporates a minimum of 50% slow release (water insoluble) nitrogen. The statements water insoluble, slowly available or slowly available soluble nitrogen also indicate slow-release forms of nitrogen. Typically, the slow-release fertilizer will list the percentage of nitrogen (expressed as a percentage by weight of the package contents) that is in the slow-release form. For example, when a 10-10-10 fertilizer is labeled as 5% slow-release nitrogen, divide the 5% slow-release nitrogen by the 10% total N in the product and multiply by 100 to get the percentage of nitrogen that is in slow-release form. In this example it is $5\% / 10\% \times 100 = 50\%$ slow-release nitrogen.

Use fertilizer that has a package slip clearly stating the percentage of nitrogen, percentage of slow-release nitrogen, percentage of phosphoric acid, and percentage of potash along with the weight (pounds) of nitrogen, weight (pounds) of phosphoric acid, and weight (pounds) of potash. Animal by-product or municipal waste fertilizers are not acceptable under this Specification. Any fertilizer which becomes caked or otherwise damaged will not be accepted.

Use solid agricultural granular lime for all permanent cover applications that is agricultural grade, standard ground limestone conforming to the current *Rules, Regulations, and Standards of the Fertilizer Board of Control*. These rules, regulations, and standards are promulgated and issued by the Fertilizer Board of Control at Clemson University in accordance with Section 16 of the *South Carolina Liming Materials Act*. Ensure that each bag has affixed in a conspicuous manner a tag or label, or in the case of bulk sales, a delivery slip showing brand or trade name, calcium carbonate equivalent, percent by weight passing prescribed U. S. Standard Sieves, and other pertinent information to identify lime as being agricultural grade, standard ground limestone.

Use fast acting liquid forms and/or dry forms of lime for all permanent cover and temporary cover by seeding applications that meet all of the requirements of agricultural grade granular lime specified herein, except percent by weight passing U.S. Standard Sieves.

1) Application Rates

- Granular Lime 100 lbs/1000 sf
- Fast Acting Lime (liquid) 0.11 gal/1000 sf
- Fast Acting Lime (dry) 2 lbs/1000 sf
- Fertilizer (N component) 3 lbs/1000 sf

*Application of lime for temporary grassing is not required.

(ii) Permanent Grassing

Permanent grassing shall be established on all unpaved areas graded or disturbed during construction. Do not perform permanent cover when the ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit. Do not perform permanent cover when the ground is excessively wet. Do not conduct permanent seeding work when the ground is excessively dry (periods

of drought) unless watering is specified in the Contract or directed by Engineer. During periods of adverse conditions, use temporary cover by mulch.

Use seed that conforms to all state laws and all requirements and regulations of the South Carolina Department of Agriculture (SCDA). Seeds containing species designated by the State Crop Pest Commission as a plant pest (i.e., noxious weeds) are not permitted. Use seed that is individually packaged or bagged and tagged. Each tag must clearly state:

- Name of company or responsible party for analysis (seller or grower)
- Net weight
- Botanical name
- Common name
- Variety
- Lot number
- Percent purity (pure seed)
- Percent germination $\geq 80\%$
- Percent by weight other crop seed
- Percent by weight of inert matter
- Percent by weight common (non-noxious) weed seed $\leq 1.0\%$ (99.0% weed free)
- Origin
- Date of packaging or date tested (date must be within 9 months of the planned date of seed application)

When mixtures of different types of permanent seed are called for in the seeding schedule it is preferred that the Contractor use pre-blended permanent seed mixtures listed on the SCDOT Qualified Product List 88 for the specific location and application. These pre-blended permanent seed mixtures are individually packaged or bagged and tagged with the tag specifying the botanical and common name of each species contained in the blend, and the percentages of each species.

The District or Engineer reserves the right to review, test, reject, or approve all seed before seeding operations begin. Seed must be used within 9 months from the date of packaging. Seed exceeding 9 months from the date of packaging will not be accepted.

1) **Seed Mixes**

April – September

Medians and Shoulders

- Common Bermudagrass (hulled) (*Cynodon dactylon*) 1.15 lbs/1000 sf
- Browntop Millet (*Panicum ramosum*) 0.23 lbs/1000 sf
- White Clover (*Trifolium repens*) 0.11 lbs/1000 sf

* SCDOT Pre-Blended Name: Upper & Lower State Spring/Summer Road Median & Shoulders Mix

Slopes (4:1 and steeper and over 5-feet in height)

- Turf-Type Tall Fescue (*Festuca arundinacea*) 1.15 lbs/1000 sf
- Common Bermudagrass (hulled) (*Cynodon dactylon*) 0.57 lbs/1000 sf
- Browntop Millet (*Panicum ramosum*) 0.23 lbs/1000 sf
- White Clover (*Trifolium repens*) 0.11 lbs/1000 sf
- Weeping Lovegrass (*Erogratis curvula*) 0.23 lbs/1000 sf
- Hairy Vetch (*Vicia villosa*) 0.23 lbs/1000 sf

* SCDOT Pre-Blended Name: Upper State Spring/Summer Slope Mix

September – April

Medians and Shoulders

- Turf-Type Tall Fescue (*Festuca arundinacea*) 1.72 lbs/1000 sf
- Common Bermudagrass (unhulled) (*Cynodon dactylon*) 0.34 lbs/1000 sf
- Crimson Clover (*Trifolium incarnatum*) 0.46 lbs/1000 sf
- White Clover (*Trifolium repens*) 0.11 lbs/1000 sf
- Rye Grain (*Secale cereal*) 0.34 lbs/1000 sf

*SCDOT Pre-Blended Name: Upper State Fall/Winter Road Median & Shoulders Mix

Slopes (4:1 and steeper and over 5-feet in height)

- Turf-Type Tall Fescue (*Festuca arundinacea*) 1.15 lbs/1000 sf
- Common Bermudagrass (unhulled) (*Cynodon dactylon*) 0.34 lbs/1000 sf
- Crimson Clover (*Trifolium incarnatum*) 0.46 lbs/1000 sf
- White Clover (*Trifolium repens*) 0.11 lbs/1000 sf
- Weeping Lovegrass (*Erogratis curvula*) 0.23 lbs/1000 sf
- Hairy Vetch (*Vivia villosa*) 0.23 lbs/1000 sf
- Rye Grain (*Secale cereal*) 0.34 lbs/1000 sf

*SCDOT Pre-Blended Name: Upper State Fall/Winter Slope Mix

(iii) Temporary Grassing

Temporary grassing shall be performed in selected areas in advance of permanent grassing operations for the purpose of minimizing erosion in graded and disturbed areas during construction operation. Temporary grassing is a supplement to and not a substitute for permanent grassing operations or erosion and sediment control measures.

1) Seed Mixes

April – August

- Browntop Millet (*Panicum ramosum*) 1.15 lbs/1000 sf

* Add oat grain at the rate of 0.25 lbs/1000 sf if the seeding date is during March and April.

August – April

- Rye Grain (*Secale cereal*) 1.25 lbs/1000 sf

* Add oat grain at the rate of 0.25 lbs/1000 sf if the seeding date is during March and April.

**The use of Italian Rye Grass is prohibited.

(b) Mulch

Typical mulch applications include straw, wood fiber, hydromulches, BFM and FGM. Use hydromulches with a minimum blend of 70% wood fibers. Use straw mulch material consisting of straw or hay. Use straw that consists of stalks of wheat, rye, barley, oats, or other approved straw. Use hay that consists of Timothy, Peavine, Alfalfa, Coastal Bermuda, or other grasses from sources approved by the Engineer. Ensure that these materials are reasonably dry and reasonably free from mature seed-bearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sandburg, Wild Garlic, Wild Onion, Wild Mustard, Crotonaria, Pigweed, Witchweed, and Cocklebur. Comply with all state and federal domestic plant quarantine regulations. Loose and separate straw mulch that is matted or lumpy before being used. Material for holding mulch in place shall be asphalt or other approved binding material or method.

No tackifiers or mulches are required for temporary seeding.

1) Tackifiers

Emulsified asphalt used as a tackifier shall be anionic meet the requirements of AASHTO M140. Ensure that emulsified asphalt is diluted at the manufacturing plant with water, if necessary, to provide a homogenous and satisfactory material for spraying.

If a chemical tacking agent is used, ensure that it consists of a polymer synthetic resin, polypectate, liquid latex, or other material that gives similar adhesive properties as asphalt emulsion when sprayed on straw and cellulose fiber mulches. Chemical tacking agents require approval by the Engineer.

Article III. Methods

Section 3.01 Handling and Storage of Materials

The Contractor shall be responsible for the safe storage of materials furnished by or to him, and accepted by him and intended for the work, until they have been incorporated in the completed project. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign materials at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

All materials required to construct this project shall be furnished by the Contractor and shall be delivered and distributed at the site by the Contractor or his material supplier. All pipe, fittings, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage. Pipe shall not be unloaded by rolling or dropping off trucks, trailers, etc. Under no circumstances shall materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

In distributing the material at the site of the work, each piece shall be unloaded on the opposite side or near the place where it is to be laid in the trench. Pedestrian or vehicular traffic shall not be unduly inconvenienced by material placed along the street right-of-way. The Contractor will string in advance, no more than the amount of pipe and material that can be installed within two (2) weeks unless approved by the District. Other material may be placed in storage yards as specified below. All materials shall be placed in such a manner as not to impede any traffic or drainage ways or obstruct traffic line-of-sight. Materials strung through residential areas (or any area with maintained lawns) shall be placed in such a manner that normal lawn maintenance is not restricted and must either be installed within two (2) weeks or removed to an approved storage yard, as required by the District. All pipes and fittings shall be thoroughly cleaned before being installed and shall be kept clean until accepted in the completed work.

The Contractor will be responsible for locating and providing any required offsite storage areas for construction materials and equipment. Unless prior written consent from the owner of the proposed storage area is received by the District, the Contractor will be required to store all equipment and materials within the project site or the limits of the right-of-way provided. The materials and equipment storage shall comply with all state and local ordinances throughout the construction period. Material and equipment may only be stored within road right-of-way if approved by the controlling agency. Plastic, PVC, and other materials susceptible to UV degradation shall be covered or protected if being stored for longer than 2-months.

Section 3.02 Waterline Installation

All piping is to be installed to the line, grade, and elevations shown on the construction drawings. Water lines are to be installed in a true line and grade and in a manner to prohibit the formation of high and low spots in the piping likely to trap air. All fitting, valves, sleeves, couplings, and appurtenances are to be compatible with, and of equal pressure class as the piping being used. Water mains shall be located out of contaminated areas, unless using protective pipe materials (i.e., DIP with chemical resistant gaskets). Water mains should have a minimum cover of 42-inches unless otherwise shown on the plans. All PVC pipe shall have a minimum cover of 36-inches. Ductile iron pipe shall be used for situations where pipe cover is less than 36-inches.

The ends of all dead-end pipes shall be securely closed to prevent entry of contaminants prior to backfill of the trench. At the end of the workday or at any time the work is to be left unattended, the open end of all pipes shall be securely closed to prevent the entry of trash, debris, or vermin.

Piping, valves, fittings, and appurtenances shall be properly installed, sterilized, pressure tested, and certified for use by the Engineer-of-Record and South Carolina Department of Environmental Services (SCDES) before the work shall be considered complete. Pipe is to be protected from mud and debris at all times.

(a) Tracer Wire

A tracer wire shall be connected to the top half (3 o'clock position) of all water main pipe. Polypropylene cable ties shall be used every 8 feet to secure the tracer wire to the pipe. Waterproof vinyl, polyethylene, or filament (strapping) tap may be used in place of cable ties. Tracer wire shall not be wrapped around the pipe.

The tracer wire shall loop at each valve and meter and be arranged to allow connection of equipment for tracking pipe and prevent interference of operating the valve or meter. Tracer wire shall be continuous from access point to access point unless otherwise approved by the Engineer. Tracer wire shall also be installed along service lines from the water main to the meter. At water service saddles, the wire shall not be allowed to be placed between the saddle and the main.

All wires must be interconnected in intersections at tees and crosses. At tees/services, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative. Direct bury wire connectors shall be specifically manufactured for use in underground tracer wire installation.

Tracer wire must be properly grounded at all dead ends/stubs. Grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 5ft of 12-gauge, red, copper clad steel tracer wire connected to anode (minimum 1.5 lb.) specifically manufactured for this purpose and buried at the same elevation as the utility. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.

Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer or District. If the tracer wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

(b) Concrete Blocking

Concrete blocking shall be provided for all underground pressurized piping at all fittings, bends, and ends of pipe to prevent movement of pipe and fittings unless other methods of restraint are approved. Concrete shall be Class 3000 per SCDOT Standard Specifications. The concrete blocking shall bear on undisturbed earth in the bottom and sides of the trench and shall be equal to or greater than the dimensions shown on the construction drawings.

(c) Separation of Water Lines and Other Utilities

Water mains should be laid at least 10-foot horizontally from any existing or proposed sewer. Where 10-foot separation is not practical, installation of the water main closer to a sewer may be allowed if the water main is laid in a separate trench, such that the bottom of the water main is at least 18" above the top of the sewer.

Water mains crossing sewers should be laid to provide a minimum vertical distance of 18" between the outside of the water main and the outside of the sewer line and both the water and sewer lines must be

ductile iron. Water mains shall be located above the sewer line when possible. At the crossing, one full length of water pipe should be centered on the sewer line so that both joints will be as far from the sewer as possible.

No flushing device shall be connected to any sewer. Chambers, pits, or manholes containing valves, blow-offs, meters, air relief valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.

(i) Force Mains

There shall be at least a 10-foot horizontal separation between water mains and sanitary sewer force mains. Where 10-foot separation is not practical, installation of the water main closer to a force main may be allowed if the water main is laid in a separate trench, such that the bottom of the water main is at least 18" above the top of the force main.

(ii) Sewer Manholes

No water pipe shall pass through or come in contact with any part of a sewer manhole or storm drainage pipe or structure.

(iii) Drain Fields or Spray Fields

Potable water lines shall not be laid less than 25 feet horizontally from any portion of a wastewater tile or spray field, or shall be otherwise protected by an acceptable method approved by SCDHEC.

(iv) Surface Water Crossings

Above-water crossings: The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

Underwater crossings: A minimum of three (3) feet of cover shall be provided over the pipe. When crossing water courses that are greater than 15 feet in width, the following shall be provided:

- a. The pipe material and joints shall be designed appropriately.
- b. Valves shall be located so the section can be isolated for testing or repair; the valves (on both sides of crossing) shall be easily accessible and not subject to flooding.
- c. A blow-off shall be provided on the side opposite the supply service. The blow-off design shall provide for a readily accessible means of flushing all water lines at a minimum velocity of 2.5 feet per second.
- d. Blow-offs shall not be directed toward any creeks or other water bodies without proper precaution being taken to dechlorinate prior to discharge.
- e. Use ductile iron pipe with mechanical joints for any lines being installed in rock.

(v) Cross Connections and Interconnections (Backflow Prevention Devices)

- a. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.
- b. No bypasses shall be allowed, unless the bypass is also equipped with an equal, approved backflow prevention device.

- c. Cross connections shall require an air gap separation or an approved reduced pressure backflow prevention device. Backflow prevention devices must be selected from the SCDES approved list.
- d. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding and shall be mounted above ground and protected with an insulated box/cover.
- e. All piping up to the inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.
- f. Fire line sprinkler systems and dedicated fire lines shall be protected by an approved double check valve assembly.

(vi) Water Loading Stations

To prevent contamination of the public water supply, the following criteria shall be met:

- a. Air Gap: A device shall be installed on the fill line to provide an air break and prevent a submerged discharge line.
- b. Hose Length: The fill hose and cross connections control device must be constructed so that when hanging freely it will terminate at least 2-feet above the ground surface.
- c. Fill Line Terminus: The discharge end of the fill line must be unthreaded and constructed to prevent the attachment of additional hose, piping, or other appurtenances.

(d) Hydrostatic (Leakage) Testing

All water lines including piping, valves, fittings, and appurtenances shall be tested by the Contractor after the pipe or section of pipe has been laid, thrust blocking cured (min. 5 days), and the trench is completely or partially backfilled. All water lines must successfully pass leakage test before being accepted by the District as properly installed. Water lines not passing the leakage test must be repaired and retested by the Contractor until the tests are successfully passed. Contractor shall install all taps and fittings required for testing.

The air is to be expelled from all water lines and the lines pressurized with water to a pressure of 1.5 times the normal operating pressure or 150 psi, whichever is greater. Maximum length of pipe being tested shall be 2000 feet. After obtaining the test pressure, the amount of subsequent water pumped into the water lines is to be measured using a metering pump or other suitable device as approved by the District. Leakage from the water lines will be considered to be the same as the amount of subsequent water pumped into the lines. This pressure shall be maintained for a minimum of two hours or up to one additional hour as the Engineer may require to detect any leakage or defective material. The test shall be witnessed by the Engineer of Record or their representative and documentation provided to the District.

No water lines will be accepted as properly installed until the leakage in each section tested is less than the amount as determined by the following formula:

$$L = \frac{N * D * \sqrt{P}}{148,000}$$

- L = Allowable leakage in gallons per hour.
- D = Nominal diameter of pipe, in inches.
- P = Average test pressure in pounds per square inch.
- N = Length of pipe.

All sections of water line failing the leakage test are to be repaired and retested by the Contractor until the water lines have successfully passed the leakage test. All visible leaks shall be repaired regardless of the amount of leakage. All re-tests shall be witnessed by the Engineer of Record or their representative and documentation provided to the District.

The Contractor shall be responsible for furnishing all hose, temporary piping, fittings, gages, pumps and transportation required to deliver the furnished water from the point of delivery by the District to the point where testing is to take place.

(i) Tapping Sleeves and Saddles

Perform a hydrostatic test of the tapping sleeve and valve assembly in accordance with the requirements above after installation of the tapping sleeve and valve, but prior to making the tap. No leakage is acceptable. The test pressure shall be maintained for a minimum of 15 minutes.

Perform hydrostatic test of tapping saddles in accordance with AWWA Standard C800.

(e) Continuous Feed Disinfection

After successfully completing leakage and pressure testing, all water lines shall be disinfected by the Contractor before being placed into service. The lines are to be thoroughly flushed out and cleaned of any dirt, mud, discoloration and debris. Disinfection shall be in accordance with AWWA Standard C651.

A disinfecting solution of chlorine or calcium hypochlorite shall be introduced at one end of the water line as water is being withdrawn at the other end so that 25 PPM of free chlorine is maintained throughout the entire water line. The chlorine solution shall remain in the piping for 24 hours, after which time the residual chlorine shall not have dropped below 10 PPM. If the chlorine residual has dropped below 10 PPM, a new disinfecting solution shall be introduced and the process repeated.

All chemicals, taps, testing points, and apparatus required for disinfecting the lines shall be furnished and installed by the Contractor.

All water for disinfection shall be furnished by the District as specified in the pressure and leakage tests. Contractor is to provide means of transporting water from Owner's delivery point to lines to be tested.

The contractor shall be responsible for the collection and delivery of water samples to be tested.

(i) Disinfection Requirements:

The Contractor or Owner shall collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction but must include all dead-end lines, be representative of the water in the newly constructed mains and shall be collected a minimum of every 1,200 linear feet.

Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating.

These samples must be collected at least twenty-four (24) hours apart and must show the water line to be absent of total coliform bacteria.

The chlorine residual must also be measured and reported.

If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated.

All samples must be analyzed by a State certified laboratory.

If the bacteriological analysis indicates that the line is not disinfected as determined by the local, State, or Federal regulations, the Contractor shall repeat the disinfecting process as described above at no expense to the District.

A copy of the passing bacteriological analysis shall be provided to the District prior to final acceptance of the water line.

(f) Record drawings

Contractor shall furnish to the Engineer one set of marked up drawings for use by the Engineer in preparation of record drawings showing all modifications to the contract drawings. This marked-up set of drawings shall include at least two dimensions from permanent objects shown on the drawings accurately locating all underground piping, valves, fittings, plug tees, dry taps, service taps or other features which may need to be located in the future. Contractor must furnish marked-up drawings to the Engineer within one week of a satisfactory bacteriological analysis.

Section 3.03 Service Connections

Where indicated on the plans, and as directed by the District, multiple water service lines shall join together prior to making the main line tap.

Upon completion and approval of testing and disinfection of the water mains, the Contractor shall begin the process of connecting the water customers to the new water mains. The Contractor shall perform the necessary relocation of the existing meter box assembly, if any, and the connection to the existing water service such that each water user is not without water service for more than three (3) hours at any one time. The Contractor shall notify all property owners who will have their water cutoff at least 24 hours prior to such cutoffs.

All existing services and water lines shall be kept in good working order until such time as the Contractor is ready to activate the new services. In addition, care shall be taken to avoid contamination of the existing water lines and service connections. The Contractor shall verify each relocated meter is reconnected to the appropriate customer.

The Contractor shall take sufficient precautions to protect any trees located on private property as well as sidewalks, driveways, and existing fences. Any damage to these items due to the Contractor's work shall be the responsibility of the Contractor. Any shrub or garden area within the private property that is in the immediate line of the proposed water service shall be removed by the Contractor and replanted after installation of water service.

(a) Water Meter Locations

Meters shall be placed at or near the right-of-way line along public roads, where practical. Meters along private roads shall be placed at or near the locations shown on the plans along the edge of the permanent easement, where practical.

Section 3.04 Trenching, Grading, Filling, & Excavation

Excavation, grading and trenching is to take place within the limits indicated on the drawings. The Contractor shall maintain proper site drainage at all times so that water does not pond or damage adjacent property. The excavation shall be kept free of water at all times during construction. The surrounding area shall be graded to slope away from the excavation, or other suitable means shall be provided to prohibit surface drainage from entering the excavation. Groundwater entering the excavation shall be continuously pumped out so that water does not accumulate in any portion of the excavation.

Proper benching or shoring and protection of all excavation and backfilling shall be the responsibility of the Contractor and shall be done in strict accordance with OSHA regulations and safe practices as required for

protection of ongoing work, existing structures, piping, utilities, and personnel. Water line trenches in streets shall not be laid back but cut vertically.

Unless otherwise noted on the drawings, the minimum trench width shall be the outside pipe diameter plus 2-feet. The Contractor shall minimize the width of the trench as much as possible. Where trenching takes place in existing concrete or asphalt roadway pavement, the pavement shall be saw cut two-feet wider than the top width of the trench, unless otherwise noted on the drawings. Ragged edges of pavement shall be re-cut as required prior to paving to form a straight and uniform alignment.

The bottom of the excavation shall be level and to the sub-grade elevation shown on the drawings. Continuous and uniform bedding shall be provided in the trench for all buried pipe. The bottom at proper sub-grade elevation shall be firm throughout and free of any soft or wet material. All bedding material shall be well compacted and shaped so that the load is supported along the entire length of the pipe barrel. Bell holes shall be dug to prohibit additional loading on the bells and to provide for completion of joints. AWWA C600/C605, Laying Condition Type 3 shall be used throughout unless the following conditions apply.

- a. Where pipe cover exceeds 18-feet, Laying Condition Type 5 shall apply.
- b. Where an unsuitable subgrade material is encountered, Laying Condition Type 4 shall apply.
- c. Where groundwater is encountered, Laying Condition Type 5 shall apply.
- d. Six (6) inches minimum of washed crushed stone shall be placed beneath all structure foundations for all excavations extending below the groundwater table. Sub-grade elevations must be adjusted to accommodate the placement of stone.

Backfilling of excavations and trenches is to be performed in such a manner as to provide a properly compacted backfill, free from rocks (greater than 6-inches in diameter), organic matter, trash, frozen material, excessively wet material, roots and other unsuitable debris. Fill material is to be placed in maximum 6-inch lifts and thoroughly compacted before placing additional layers. Backfill of all piping shall be done in such a manner so that stones or debris are not bedded against or within 6-inches of the pipe. Back-fill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe.

Compaction testing may be conducted at the recommendation of the Engineer to ensure that all placed and compacted material, to include fill and backfill of structures and piping, complies with the specifications. Minimum compaction shall be 90% of maximum dry density outside road rights-of-way and 95% of maximum dry density within road rights-of-way, driveways, sidewalks, and parking lots as measured by the AASHTO method T99. Testing is to be performed by a licensed testing laboratory at locations determined by the Engineer.

(a) Rock Excavation

Rock excavation shall be defined as solid rock that requires drilling and blasting, sledging, or barring for its removal. Soft, disintegrated rock that can be removed with a pick shall not be classified as solid rock. Boulders greater than one cubic yard in volume will also be considered rock excavation. Smaller boulders and soft rock which in the opinion of the Engineer can be excavated by the use of an excavator or backhoe, without undue delay, shall not be classified as rock.

Rock shall be removed to the following limits as measured between vertical planes

- twelve inches (12") outside the pipe bell parallel to the water line and for a depth of six (6) inches below the pipe bell.
- Rock around structures shall be removed to the same 12-inch limit as measured between vertical planes around the structure to a depth necessary to allow proper installation of the structure. Over

excavation of rock due to removal methods, or for safety considerations, shall be the Contractors responsibility.

Rock excavation shall be accomplished by ripping or blasting by experienced personnel in a manner that protects existing structures, piping, utilities, and personnel from damage or injury. Rock and other debris resulting from such excavation shall be hauled from the site by the Contractor and properly disposed of. Personnel responsible for blasting shall be responsible for obtaining all licensing, permits, and insurance required by the State of South Carolina.

The Contractor shall notify the District and the Engineer prior to excavating rock so that personnel may be present to measure the rock as it is being excavated and before any backfilling takes place. No payment for Rock Excavation will be made to the Contractor for rock removal unless actual rock measurements have been taken by the District or the Engineer.

Section 3.05 Protection of Work Area

All work is to be performed in accordance with OSHA requirements and State and local rules and regulations. Barricades and other protective devices shall be used to prevent damage to existing structures, equipment, utilities, pavement, fencing, and property, as well as to prevent damage to ongoing work.

- a. The Contractor is responsible for maintaining all existing utilities, roads, structures, construction staking and property corners free from damage. The Contractor shall be responsible for verifying the location and existence of all structures and utilities within or adjacent to the project area. Any item that is damaged during construction shall be promptly repaired by the Contractor, at his own expense, to its original or better condition unless otherwise directed by the District.
- b. Adjacent property is to be protected from damage from equipment, clearing and grubbing operations, disposal of materials, drainage from the construction site, and storage of dirt and debris.
- c. Any ongoing work, existing structures, piping, utilities, equipment, and property damaged during the site work is to be immediately restored to its original or better condition at the expense of the Contractor.
- d. Trees and vegetation remaining in place are to be protected from damage from skinning, cutting, or breakage of limbs, bark, and roots, stockpiling of construction or excavated materials within the drip line, and compaction, of soil within the drip line due to vehicular or foot traffic. Temporary barricades, fencing or any other appropriate means of protection are to be used. Damaged trees and vegetation are to be restored under the supervision of a tree surgeon or replaced by the Contractor at no additional expense to the District.
- e. The Contractor shall conduct all work with full consideration of all proper and legal rights of the District, adjacent property owners and the public and with the least possible amount of inconvenience to them.
- f. Before beginning any excavation, the Contractor shall be responsible for notifying Palmetto Utility Protection Service (1-888-721-7877) for location of all public utilities in the work area and protecting such utilities from damage during construction. The drawings may not show the exact location of all utilities. Failure to show existing utilities on the drawings shall not relieve the Contractor from the responsibility of locating and protecting all utilities from damage prior to and during construction. Utilities damaged during construction shall be immediately repaired at the Contractor's expense.

Section 3.06 Clearing and Grubbing

All stumps, roots, weeds, grass, and other vegetation are to be cleared from the project site and rights-of-way within the limits shown on the plans and as specified herein. All stumps, logs, brush, and other debris resulting from the cleaning operation are to be disposed of in a legal manner and hauled from the site.

Water line rights-of-way off public road rights-of-way are to be completely cleared and grubbed a minimum of ten (10) feet on either side of the center line of the entire length of the water line unless otherwise noted or specified. With prior approval of the District, additional width is to be cleared and grubbed if in the opinion of the District it is required for construction of the water line. All cleared areas are to be grubbed and grassed. Water lines along highway rights-of-way are to be cleared only as required for construction. Protect bushes, shrubs, and trees specifically marked for protection.

Section 3.07 Removal of Existing Structures

Existing structures, pavement, walks, curbs, gutters, fences, trees, bushes, shrubbery, etc., and all other items within the project limits shall be removed from the construction site.

Section 3.08 Disposal of Debris

All debris and material resulting from construction must be hauled from the site and properly disposed of. Debris and excess material stockpiles shall be removed from the site within 10 days. Burning of cleared and grubbed material shall not be allowed.

Section 3.09 Paving and Surfacing

Pavement shall be removed a minimum of 12-inches on each side of the trench.

(a) Pavement

Macadam (Aggregate) base course shall meet the requirements of Section 305 – *Graded Aggregate Base* in the SCDOT Standard Specifications for Highway Construction.

Asphalt pavements shall meet the requirements for hot mixed asphalt pavement in Section 400 – *Asphalt Pavements* of the SCDOT Standard Specifications for Highway Construction.

Concrete shall meet the requirements of Section 701 – *Portland Cement and Portland Cement Concrete* in the SCDOT Standard Specifications for Highway Construction.

Flowable fill shall be excavatable, non-air entrained unless otherwise specified. Flowable fill shall meet the requirements of SCDOT Supplemental Technical Specification SC-M-210.

Pavement placement including but not limited to: sub-base preparation, base preparation, asphalt placement, tack or prime coat, and concrete placement shall be performed in accordance with the SCDOT Standard Specifications for Highway Construction.

(b) Pavement Markings

All pavement markings destroyed, damaged, or removed for construction shall be replaced. Pavement markings shall be thermoplastic and meet the requirements of Section 627 – *Thermoplastic Pavement Markings* in the SCDOT Standard Specifications for Highway Construction.

Section 3.10 Erosion Control/Seeding

Install and maintain all erosion control measures shown on the plans in accordance with the SCDHEC best management practices and the plans. Temporary or permanent seeding and mulching shall be performed for every 1,500-feet of installed water line or per the erosion and sediment control requirements, whichever is shorter.

(a) Seeding

If the area has been recently plowed, no tillage is required other than raking or surface roughening to break any crust that has formed leaving a textured surface. Disk the soil for optimal germination when the

soil is compacted less than 6-inches. If the soil is compacted more than 6-inches, sub-soil and disk the area.

Apply the soil amendments (fertilizer, lime, etc.) at the specified rate into the top 4-6 inches of the soil by disking or other means where conditions allow. Do not mix the lime and the fertilizer prior to the field application. Soil amendments may be adjusted based on soil testing report. Soil testing is available through Clemson University Cooperative Extension Service. Application of lime for temporary grassing is not required but may be beneficial for the establishment of permanent seeding.

Loosen the surface of the soil just before broadcasting the seed. Evenly apply seed by the most convenient method available for the type of seed applied and the location of the seeding. Typical application methods include but are not limited to cyclone seeders, rotary spreaders, drop spreaders, broadcast spreaders, hand spreaders, cultipacker seeder, and hydro-seeders. Cover applied seed by raking or dragging a chain or brush mat, and then lightly compact the area with a roller or cultipacker. Do not roll seed that is applied with a hydro-seeder and hydro-mulch.

Cover all permanent seeded areas with mulch immediately upon completion of the seeding application to retain soil moisture and reduce erosion during establishment of vegetation. Apply the mulch evenly in such a manner that it provides a minimum of 75% coverage. Apply straw mulch by hand or machine at the rate 2 tons per acre (90 pounds per 1000 square feet). Frequent inspections are necessary to check that conditions for growth are good.

Keep permanent seeded areas adequately moist, especially late in the specific growing season. Irrigate the seeded area if normal rainfall is not adequate for the germination and growth of seedlings. Water seeded areas at controlled rates that are less than the rate at which the soil can absorb water to prevent runoff. Runoff of irrigation water wastes water and can cause erosion.

STANDARD DETAILS