August 6, 2012

LUMPKIN COUNTY

SPECIAL PROVISION

Utility Conflicts

Utility companies having known facilities that conflict with the construction of this project will be directed by the Department to adjust or relocate their facilities and will be notified of the contract award.

Conform to all the requirements of the Specifications as they relate to cooperation with utility owners and the protection of utility installations that exist on the project. Refer to the requirements of Section 107, Legal Regulations and Responsibility to the Public, with particular attention to Subsection 107.21.

Coordinate The Work with any work to be performed by others in any right of way clearance and arrange a schedule of operations that will allow for completion of the Project within the specified contract time. Where stage construction is required, notify the utility owner when each stage of work is completed and the site is available for utility work to proceed.

Information concerning utility facilities known to exist within the project limits, including the list of owners, is available for reference.

Under Georgia Code Section 32-6-171, utilities are required to remove or relocate their facilities. The Department is required to give the utility at least 60 days written notice directing the removal, relocation, or adjustment and the utility owner is required to begin work within the time specified in the utility's work plan or revised work plan.

Upon request, copies of all approved Work Plans submitted by utility companies having facilities on this project will be made available for examination by the Contractor at the Department's District Office. Utility Adjustment Schedules, when submitted to the Department by the utilities, will be made available to the Contractor after the Notice to Contractors has been posted by the Office of Construction Bidding Administration. The Contractor is responsible for considering in its bid all existing and proposed utility locations and the removals, relocations, and adjustments specified in the Utility's Work Plan.

For this Project, Utility Owners that are required to remove, relocate, or adjust their facility to accommodate the construction of this Project may be liable to the Contractor for damages or delay costs resulting from the Utility Owner's failure to clear conflicts

within the time specified in the approved Utility Work Plan. If the Utility Owner is unable to submit and obtain Department approval of a revised Work Plan or fails to complete the removal, relocation, or adjustment of its facilities in accordance with the approved Work Plan, the Utility Owner may be liable to the Department, or the Contractor, for damages or delay costs.

In accordance with Subsection 105.06 of the Specifications, the Department is not liable for payment of any claims due to utility delays, inconvenience or damage sustained by the Contractor due to interference of any utilities or appurtenances, or the operation of moving them.

In any case in which the Contractor believes that it will be entitled to damages or delay costs from the Utility Owner in accordance with O.C.G.A. 32-6-171, the Contractor shall provide written notice to the Utility Owner and the Department within ten (10) days from the time of the dispute or potential dispute is identified. The Contractor shall follow the Procedures for Utility Damages or Delay Costs outlined in the latest edition of The Utility Accommodation Policy and Standards Manual. Failure to follow the above will result in waiver of the Contractor's claim against the Utility Owner for damages or delay costs.

In accordance with Subsection 107.21.G delays by utilities will continue to be considered by the Department in charging Contract Time. For purposes of applying provisions of this paragraph, railroads and the Metropolitan Atlanta Rapid Transit Authority (MARTA) are considered utilities.

Revised: November 13, 2014

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

PROJECT: 0010195

COUNTY: Lumpkin

P.I.: 0010195

Section 660—Sanitary Sewers

Delete Section 660 and substitute the following:

660.1 General Description

This Work consists of furnishing materials, labor, tools, equipment, and other items necessary for installing, removing, abandoning, relocating, and adjusting sanitary sewer and force main systems and appurtenances to the Plans and Specifications.

660.1.01 Definitions

A. General Provisions 101 through 150

B. The term "The Facility Owner" shall be understood to mean "City of Dahlonega".

C. The term "Project Manager" shall mean the authorized individual having the authority to give instructions pertaining to the work and to approve or reject the work. The "Project Manager" shall not however be authorized to revoke, alter, enlarge, relax, or release any requirements of the Contract, Plans, and Specifications, nor shall they act as an agent for the Contractor. All Contract items pertaining to the Utility Owner shall be coordinated with the Georgia Department of Transportation's (GDOT) Project Coordinator and the Utility Owner.

660.1.02 Related References

A. Standard Specifications

Section 104—Scope of Work
Section 107—Legal Regulations and Responsibility to the Public
Section 108—Prosecution and Progress
Section 205—Roadway Excavation
Section 207—Excavation and Backfill for Minor Structures
Section 400—Hot Mix Asphaltic Concrete Construction
Section 444—Sawed Joints in Existing Pavements
Section 500—Concrete Structures
Section 600—Controlled Low Strength Flowable Fill

Section 615—Jack or Boring Pipe

Section 611—Relaying, Reconstructing, or Adjusting to Grade of Miscellaneous Roadway Structures

Section 668—Miscellaneous Drainage Structures

Section 801—Fine Aggregate

Section 810—Roadway Materials

B. Related Documents

1. General Provisions 101 through 150.
2. All products supplied and all work performed shall be in accordance with The Facility Owner's Standard Specifications, applicable standards from American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), GDOT Utility Accommodation Policy and Standards, and the Georgia Environmental Protection Division (EPD) Guidelines for Sewage Collection Systems. Latest revisions of all standards shall apply.

660.1.03 Submittals

A. General Provisions 101 through 150.

B. Refer to The Facility Owner's Standard Specifications, current published edition, for sanitary sewer utility submittal requirements. Copies of all submittals and documentation shall be submitted to GDOT, who shall distribute to the Utility Owner.

C. Shop Drawings / Product Data

1. Submit 6 copies of the following submittals to the GDOT Project Coordinator:
   a. Product data, including size, dimension, capacity, pressure rating, accessories, and special features, installation instructions, and operating characteristics for all proposed materials to show compliance with the requirements of this Special Provision.
   b. Test reports specified in the Quality Acceptance section of this Special Provision.
   c. Pipe manufacturer certification of compliance with specifications.
   d. Operation and maintenance literature, warranties, and other specified information.

D. Construction Record Documentation

1. The Contractor shall record on two set of utility as-built drawings that will record changes and deviations from the Contract Drawings in sizes, lines or grade. Record also the exact final horizontal and vertical locations of underground utilities and appurtenances to an accuracy of +/- 0.2ft, referenced to permanent surface improvements. Drawings shall utilize State Plane Coordinates and shall be legibly marked to record actual construction and submitted to the GDOT no later than 30 days after installation and prior to Final Acceptance of the Project. The Utility Owner shall determine if the utility record drawings are complete prior to Final Acceptance of the project.
2. Record Drawings shall be signed and sealed by a professional engineer or land surveyor registered in the State of Georgia.
3. Record Drawings shall also be submitted in digital format as indicated in accordance with the Department's current Electronic Utility File Guidelines.
4. Except for standard bound materials, bind all 8.5"x11" (A4) documentation, including 11" x 17" (A3) drawings folded to 8.5"x11" (A4), in logical groupings in loose-leaf binders of either the 3-ring or plastic slide-ring type. Permanently and appropriately label each such bound grouping of documentation.

660.1.04 Quality Assurance

A. The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project.

B. Furnish manufactured items, pipe, fittings, valves, service components, and appurtenances from manufacturers having regularly produced such items as specified herein which have proven satisfactory in actual service, over at least a 2-year period, or as approved by the GDOT and Utility Owner.

C. Regardless of tolerances permitted by industry standards specified herein, GDOT Project Manager may reject pipe or appurtenances at the manufacturing plant or project site which have cracks, chips, blisters, rough interior or exterior surface, evidence of structural weakness, joint defects, or other imperfections that might in the opinion of the Project Coordinators contribute to reduced functional capability, accelerated deterioration or reduced structural strength.

D. The Utility Owner and the Utility Owner's consultant shall have the right to visit and inspect the work at any time. The Utility Owner may also have an Inspector assigned to the project authorized to inspect portions or all of the utility work done and the preparation, fabrication, or manufacture of the materials to be used. The Utility Owner shall be able to advise GDOT Project Manager of any observed discrepancies or potential problems. The cost of these inspections shall be the responsibility of the Utility Owner.

E. GDOT shall notify the Utility Owner before authorizing any changes or deviations which might affect the Utility Owner's facilities. Contractor shall notify GDOT and Utility Owner a minimum of 24 hours prior to beginning work on utilities.

F. The Utility Owner shall be notified by GDOT Project Manager when all utility work is complete and ready for final inspection. The Utility Owner shall be invited to attend the final inspection and may provide a corrections list to GDOT Project Manager prior to the final inspection.

G. The Contractor shall verify the actual location and depth of all utilities prior to construction. All utilities and structures shall be protected during construction. Any damaged facilities shall be repaired or replaced at the Contractor's expense.

660.2 Materials

H. All materials provided shall be in conformance with the requirements and standards set forth in the The Facility Owner's specification document, current published edition.

660.2.01 Sanitary Sewer Piping Systems and Appurtenances

A. Ductile Iron Pipe and Fittings

Ductile iron pipe shall meet the latest edition of ANSI/AWWA C150/A21.50 and C151/A21.51 for the class and joint specified with a nominal laying length of 18 (5.5 m) to 20 feet (6 m). Joints for buried ductile iron pipe shall be mechanical or push-on joints. Unless specified otherwise in the Plans or The Facility Owner's Standard Specifications, ductile iron pipe diameters 12 inch (300 mm) or less shall be minimum Pressure Class 350, while pipe diameters greater than 12 inch (300 mm) shall be minimum Pressure Class 250.

1. Ductile iron pipe for the interior of structures and above ground installations shall be flanged. Flanges shall be ductile iron and shall be threaded-on flanges conforming to ANSI/AWWA C115/A21.15 or cast-on flanges conforming to ANSI/AWWA C110/A21.10. The minimum class thickness for ductile iron flanged pipe to be threaded is Class 53.
2. Interior surfaces of ductile iron pipe and fittings shall be ceramic epoxy lined. Epoxy lining shall be 40-mil nominal dry film thickness. The interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first 6 inches (150 mm) of the exterior of the spigot ends. The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings. Surface preparation, lining of pipe, coating of bell sockets and spigot ends, number of coats, and touch up and repair shall be in accordance with the manufacturer's recommendations. The pipe or fitting manufacturer shall supply a certificate attesting that the applicator met the requirements of this specification; that the material used was as specified; that the linings have the nominal dry film thickness specified; and that the linings have no pinholes when tested with a nondestructive 2,500 volt test. Lined pipe and fittings shall be handled only from the outside of the pipe and fittings.
3. Ductile iron shall have an exterior asphaltic coating as specified in AWWA C151 for ductile iron pipe and AWWA C153/C110 for ductile iron fittings.
4. Buried ductile iron pipe and fittings shall be polyethylene encased at locations indicated on the Plans or as conditions warrant. Polyethylene encasement tubing shall be in accordance with ANSI/AWWA C105/A21.5 and ASTM A674 and shall have a minimum thickness of 8 mils. Polyethylene tubing shall be green in color to designate wastewater.
5. Fittings: Ductile iron fittings shall be epoxy coated and meet the requirements of ANSI/AWWA C153/A21.53 or

ANSI/AWWA C110 A21.10 with a minimum pressure rating of 250 psi. Pressure pipe fittings shall be restrained mechanical joint.

6. Mechanical Joint Fittings: Mechanical joints consisting of bell, socket, gland, gasket, bolts, and nuts shall conform to ANSI/AWWA C111/A21.11.
7. Push-On Joints: Push-on joints shall be designed in accordance with ANSI/AWWA C111/A21.11. Joint lubrication shall be as furnished by the manufacturer.
8. Rubber gasket joints for push-on or mechanical joints shall conform to the requirements of ANSI/AWWA C111/A21.11.
9. Restrained Joints: Restrained joints shall be provided as shown on the Plans and where required for thrust restraint. Restrained joints shall not require field welding or grooves cut into the pipe barrel for restraint. The restraining joints for mechanical joint fittings shall conform to the requirements of ANSI/AWWA C111/A21.11 with assembly in conformance with AWWA C600 and manufacturer's recommendations. Restrained joints for pipe shall be mechanical joints with ductile iron retainer or push-on type joints and shall have a minimum rated working pressure of 250 psi.
10. Mechanical joint retainer glands may be used to restrain mechanical joint pipe and fittings to the plain end of ductile iron pipe and fittings. Restrainer glands shall be manufactured of ductile iron per ASTM A536.
11. Corrosion-resistant bolts used with ductile iron joints shall be high-strength, low-alloy steel as specified in ANSI/AWWA C111/A21.11.
12. Welded Outlets: Welded outlets in ductile iron pipe shall be provided where specified and indicated on the Plans. Outlets shall be fabricated by welding sections of ductile iron pipe manufactured in accordance with ANSI/AWWA C151/A21.51. Welded outlet pipe shall be fabricated only by the pipe manufacturer. The minimum ductile iron pipe thickness for fabrication of welded outlet pipe shall be Thickness Class 53 for 4 inch to 54 inch (100 mm to 1350 mm) diameter pipe. All joints on welded-on branch outlets shall be provided in accordance with the latest revision of ANSI/AWWA C111/A21.11 and/or ANSI/AWWA C115/A21.15 as applicable. After the outlets are welded together and prior to finishing, the assembly shall be subjected to a 15 psi air test for leakage. The maximum size and laying length of the welded-on branch outlet shall be recommended by the pipe manufacturer and acceptable to the Utility Owner for the field conditions and connecting pipe or valve.

B. Polyvinyl Chloride (PVC) Pipe

1. C900 PVC pipe diameters 4-inch (100 mm) through 12-inch (300 mm) shall meet ANSI/AWWA C900 requirements, and shall be a minimum pipe dimension ratio (DR) 18, Pressure Class 235 psi. C905 PVC pipe diameters 14-inch (350 mm) and greater shall meet ANSI/AWWA C905 requirements, shall be DR 18 minimum, Pressure Class 235 psi. Pipe shall have a bell with an integral wall section with a factory installed, solid cross section elastomeric ring in accordance with ASTM F477.
2. PVC solid wall gravity sewer pipe shall be integral bell and spigot joint pipe, and shall comply with ASTM D3034 for pipes 15-inch (380 mm) and smaller, with minimum standard dimension ratio (SDR) 26. Pipes larger than 15-inch shall comply with ASTM F679 with the minimum thickness as specified in the Plans or The Facility Owner's specification document. Joints shall be of the bell and spigot gasketed type in accordance with ASTM D3212 and ASTM F477.
3. All PVC pipe shall be formulated for sunlight exposure and shall be green in color to designate wastewater.
4. PVC pipe shall have the same outside diameter (OD) as ductile iron pipe and be compatible for use with ductile iron fittings.
5. Fittings for PVC pipe 4 inches (100 mm) and larger shall be ductile iron mechanical joint and comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.
6. Restrained Joints: Restrained joints shall be provided as shown on the Plans and where required for thrust restraint. Restrained joints shall comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings, with assembly in conformance with AWWA C600 and manufacturer's recommendations.

7. Unless specified otherwise in the Plans or The Facility Owner's specification document, 2-inch (50 mm) and 3-inch (80 mm) diameter PVC pipe shall conform to the requirements of ASTM D2241 Class 1120 or 1220 (SDR 21) with a working pressure rating of 200 psi with integral bell gasketed joints. Pipe is to be manufactured to IPS standard pipe equivalent outside diameters.
8. Schedule 80 PVC pipes smaller than 4-inch (100 mm) nominal diameter shall be in accordance with ASTM D1785. Schedule 80 pipe shall have threaded joints. Solvent cemented joints shall not be used. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All threaded joints shall be watertight.
9. Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively.

C. Fusible PVC Pipe

1. Fusible PVC pipe sizes 4-inch (100 mm) to 36-inch (900 mm) shall conform to AWWA C900/C905 as applicable and follow the dimension ratios (DR) set forth in the requirements listed for C900 PVC pipe.
2. Fusible PVC pipe shall be green in color to designate wastewater.
3. Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
4. Fusible PVC pipe shall be manufactured in a standard 40-foot nominal length or custom lengths as specified.
5. Joints shall be made by butt fusing sections of pipe with manufacturer-approved equipment.
6. Fittings shall be ductile iron mechanical joint and comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.

D. High Density Polyethylene (HDPE) Pipe

HDPE pipe sizes 4-inch (100 mm) and larger shall be a PE 4710/3408 high density, extra-high molecular weight polyethylene manufactured from first-quality high density polyethylene resin containing no additives, fillers, or extenders. The HDPE pipe shall have an ASTM D3350 cell classification of PE 445574C, and shall meet the requirements of AWWA C906, and shall be sized based upon the ductile iron pipe size (DIPS), outside diameter (OD) sizing system. HDPE shall be a minimum DR 11, pressure class 160 psi. For gravity sewer pipe, the DR of the pipe shall be as indicated in the Plans or The Facility Owner's Standard Specifications.

1. HDPE pipe shall be green or marked with a permanent green stripe to designate wastewater.
2. Joints shall be made by butt fusing sections of pipe with manufacturer-approved equipment.
3. Fittings shall be ductile iron mechanical joint meeting the requirements of ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11.
4. The pipe shall have fusion welded restrainer ring, follower gland, and a 12-inch (300 mm) stainless steel insert for the mechanical joint connection.
5. HDPE sewer mains shall be properly sized utilizing the inside diameter of the nominal pipe diameter. If during construction HDPE is substituted for other pipe materials, the Contractor shall verify that the inside diameter of the HDPE is the same or larger than the inside diameter of the pipe originally specified.

E. Concrete Pipe

1. Concrete pipe for gravity sewers shall be epoxy lined, reinforced concrete bell and spigot pipe with type two cement and calcareous aggregate conforming to ASTM C76 for Wall C pipe. Pipe shall be supplied in lengths of at least eight feet (2.5 m).
2. Pipe shall have rubber gasket type joints with steel end rings conforming to ASTM C443. A rectangular groove shall be supplied in the spigot end to receive the rubber gasket, and it shall be so formed to a rectangular shape and confined on all four sides. Bell and spigot surfaces shall be accurately formed and smooth to provide a close sliding fit with a nominal clearance of 1/16-inch (1.5 mm).

3. Pipe shall not have cracks, blisters, imperfect surfaces, damaged ends, or damaged gasket grooves. Repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders shall not be used.
4. The testing of concrete pipe for crushing strength, absorption, hydrostatic requirements, and permeability shall be at the direction of the Utility Owner / GDOT Project Coordinators and shall be performed in accordance with ASTM C497.

F. Steel Casing Pipe

1. All materials, design, fabrication, handling, and testing of steel casing pipe shall conform to the requirements of ASTM A139, AWWA C200 and AWWA Manual M11 "Steel Pipe – A Guide for Design and Installation."
2. Steel casing pipe shall be new, smooth-wall, carbon steel pipe conforming to ASTM Specification A139, Grade B with minimum yield strength of 35,000 psi. Steel casings shall be used with the size, minimum thickness, length, and coating specified on the Plans or The Facility Owner's specification document.
3. Additional anti-corrosion measures, as specified by the manufacturer or indicated on the Plans, shall be provided at connectors, couplings, rollers, restraints, etc.
4. Unless specified otherwise in the Plans or The Facility Owner's specification document, casing pipe end seals shall consist of ⅛-inch (6 mm) thick flexible synthetic rubber boot with adjustable stainless steel banding straps. The annular space of the casing shall not be filled with concrete or grout.
5. Casing spacers shall consist of a stainless steel shell, PVC ribbed liner, and non-conducting separators to keep the carrier pipe from touching the casing pipe. Spacers shall be provided at a maximum of 10-foot intervals and within 2 feet (0.6 m) of the end of the casing pipe.

G. Cured-In-Place-Pipe (CIPP) Liners

1. CIPP liners shall be installed at the locations indicated on the Plans for the renovation of existing sanitary sewer pipes. The CIPP process shall consist of furnishing and inserting a resin-impregnated flexible tube within an existing sanitary sewer pipe and permanently forming the tube to the original conduit by curing with hot water under hydrostatic pressure or by a compressed air/stream combination.
2. CIPP pipeliner components shall be made from approved materials and manufactured in accordance with ASTM F1216, ASTM F1743, ASTM D5813, and ASTM D790.
3. CIPP tube shall meet the following criteria:
4. Made up of one or more layers of felt fabric
5. Meets or exceed ASTM F1216 or ASTM F1743, Section 5
6. Withstands installation pressure and is strong enough to bridge missing pipe sections where necessary.
7. Stretches to fit irregular pipe sections
8. After wetout (impregnating of the tube with resin), shall maintain a uniform thickness meeting or exceeding the design thickness when compressed at installation pressures
9. Sewn to a size fitting tightly within the internal circumference and length of the original pipe when installed and shall provide required allowance for circumferential stretching during inversion
10. Does not utilize overlapping layers of felt in longitudinal seams causing lumps in the final product
11. Utilizes an impermeable, flexible membrane coated on the outside layer of the tube prior to wetout to contain the resin and facilitate monitoring of resin saturation during the wetout procedure
12. Is homogenous across the entire wall thickness and contains no intermediate or encapsulated elastomeric layers
13. Does not utilize material in the tube causing delamination in the CIPP pipeliner
14. Seams in the tube are stronger than the non-seamed felt
15. Outside of the tube is marked for distance at regular intervals along its length. Marking intervals do not exceed 5 feet (1.5 meters) and include the Manufacturers name or identifying symbol.
16. CIPP resin system shall produce CIPP pipeliners which comply with the structural and chemical resistance requirements of this specification. Resin system shall be corrosion resistant, consist of a vinyl ester and catalyst system, and contain 5% or less resin filler. When properly cured within the tube composite, the resin shall meet or exceed the requirements of ASTM F1216 and ASTM F1743, the physical properties herein, and those which are to be utilized in the design of the CIPP liner.

17. CIPP pipeliners shall meet the following criteria:
18. Requirements of ASTM F1216, Appendix XI.
19. No bonding to original pipe wall assumed
20. Utilizes a long-term, time dependent flexural modulus value obtained from long-term testing results for flexural creep of the CIPP material installed by the installer on previous projects consisting of the same work
21. Utilizes a percentage of the instantaneous flexural modulus value as measured by ASTM D790 testing in design calculation for external buckling. Does not use values in excess of 50% unless substantiated by qualified

    independent testing laboratory data.
22. Produced using materials of equal quality or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.
23. Utilizes an enhancement Factor "K" value of 7 for "partially deteriorated" design conditions. Does not use Enhancement (K) factors in excess of 7 unless substantiated by qualified independent testing laboratory data.
24. Produced with uniformly bonded layers. Any two layers cannot be cleanly separated with a probe or point of a knife blade or separated in a manner that allows the probe or knife to move freely between layers.
25. Produces with light, a reflective interior wall color to allow clear, detailed examination with closed circuit television inspection equipment.
26. Conforms to the structural properties listed in the following table:

MINIMUM STRUCTURAL PROPERTIES			
Property	**Test Method**	**Cured Composite per ASTM F1216**	**Cured Composite (400k Resin)**
Modulus of Elasticity	ASTM D790 (short term)	250,000 psi (1,722,500 kPa)	400,000 psi (2,756,000 kPa)
flexural Stress	ASTM D790	4,500 psi	4,500 psi
		(31,000 kPa)	(31,000 kPa)

a. Produced with a minimum wall thickness of ¼ in (6 mm) throughout the line. Wall thickness is based on the physical properties listed in the table above and the design equations in the appendix of ASTM F1216, using the design parameters listed in the following table:

DESIGN PARAMETERS	
Design Safety Factor	2.0
Retention Factor for Long-Term Flexural Modulus (determined by long-term testing described above)	1%-60%
Ovality	2%
Enhancement Factor, k	7

b. Layers of the tube not saturated with resin prior to insertion into the existing pipe are not included in the structural CIPP pipeliner wall thickness computation.

c. Meets or exceeds chemical resistance requirements of ASTM F116, Appendix X2

d. Contains no dry or saturated layers

H. Pipe Detection Wire

Unless otherwise specified in the Plans or The Facility Owner's Standard Specifications, open cut installations of non-metallic pipe shall include minimum #12 gauge tracing wire. Pipe installed by directional drill shall include two (2) insulated 8 gauge tracer wire. Wire shall be solid copper insulated with HDPE installed along pipe, wrapped around service line stub outs and stubbed into valve boxes for locating purposes. Wire shall be properly spliced to provide continuous conductivity.

I. Warning Tape

Sanitary sewer mains shall be installed with polyethylene film warning tape manufactured for marking and identifying underground wastewater utilities. Tape shall be a minimum of 2 inches (50 mm) wide and 4 mils thick, green in color, with continuously printed letters reading "CAUTION BURIED SEWER LINE BELOW".

J. Gate Valves

1. Gate valves sizes 3-inch (80 mm) and larger shall be of the resilient seat type meeting the requirements of AWWA C509 or C515. Valves shall be iron body, bronze trimmed, with non-rising stems, and shall be fusion-bonded epoxy coated per ANSI/AWWA C550. Valves shall have a minimum design working pressure of 200 psi.

Valves shall be manually operated by nut and open counter-clockwise unless specified otherwise in the Plans or The Facility Owner's Standard Specifications.

2. The resilient seating arrangement shall provide zero leakage at the design working pressure when installed with line flow in either direction. All ferrous surfaces inside and outside shall have a fusion bonded epoxy coating. All valves shall be provided with O-ring seals. The design and machining of valves shall be such as to permit replacing the O-ring seals in the valves while in service without leakage.

3. All gate valves, when fully opened, shall have an unobstructed waterway diameter equal to or larger than the full nominal diameter of the valve.
4. In general, valves shall be designed for vertical installation. Valves installed in the horizontal position shall be provided with bevel gears, extended gear case, rollers, tracks, and scrapers.
5. Exposed or above-ground gate valves shall be outside screw and yoke (OS&Y) flanged joint type with an operating hand wheel. The face-to-face dimensions and drilling shall conform to ANSI B16.10 for Class 125 flanged joint end gate valves.
6. Valves shall include mechanical joints, bolts, glands, gaskets, and all other materials necessary to join to existing work.
7. Provide brass identification tag imprinted with "SEWER", valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch thick brass with a ¼-inch (8 mm) hole.

K. Insertion Valves

1. Insertion type valves shall be resilient wedge gate valves designed to be installed into an existing pressurized force main without interruption of flow through the pipe and no reduction of line pressure.
   a. Valve shall be fusion-bonded epoxy coated in compliance with AWWA C550.
   b. The construction of the resilient wedge shall comply with AWWA C509 requirements.
   c. The resilient wedge shall be fully encapsulated with EPDM rubber and shall seat on the valve body and not the pipe. The resilient wedge shall be totally independent of the carrier pipe.
   d. Valve shall be restrained to the pipe.
   e. Valves shall be suitable for operating pressures up to 250 psi.

L. Plug Valves

1. All plug valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall comply with

AWWA C517 requirements. The pipe connections shall be flanged or mechanical joint as required. Flanged valves shall be in accordance with ANSI B16.1, Class 125 and ANSI B16.5, Class 150. Mechanical joint valves shall be in accordance ANSI/AWWA C111/A21.11. Buried plug valves shall have mechanical joint ends. Valve and gearing shall be rated for a minimum of 150 psi pressure rating.

2. Valves shall be coated with an epoxy coating applied to both the exterior and the interior surfaces prior to assembly of the valves.
3. Unless specified otherwise in the Plans or The Facility Owner's Standard Specifications, the port area shall be 100% of standard full pipe area. The body of the valve shall be constructed of cast iron ASTM A126 Class B. Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings. These bearings shall comply with current AWWA Standards. Both nut and gear operated valves shall have a 2-inch (50 mm) square nut for operation.
4. Provide brass identification tag imprinted with "SEWER", valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch (6 mm) thick brass with a ¼-inch (8 mm) hole.

M. Check Valves

1. Swing check valves sizes 4-inch (100 mm) through 30-inch (750 mm) shall be constructed of a cast iron body with a bronze seat ring, and a noncorrosive shaft for attachment of weight and lever. Check valves shall comply with AWWA C508 requirements and have a 150 psi minimum pressure rating.
2. The valve disc shall swing completely clear of the waterway when valve is fully open, permitting full flow. The disc shall be cast iron, rubber faced.
3. Check valves shall be flanged in accordance with ANSI 16.1, Class 125, and installed inside a vault or pit.
4. Provide brass identification tag imprinted with "SEWER", valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch (6 mm) thick brass with a ¼-inch (8 mm) hole.

N. Tapping Sleeves and Valve Assembly

1. Tapping sleeves and valves sizes 4-inch (100 mm) and larger shall be stainless steel with wraparound gasket style, or ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be rated for a minimum 150 psi working pressure in accordance with ANSI/AWWA C110/A21.10.
2. When tapping an existing asbestos cement pipe, a stainless steel tapping sleeve which contains a full gasketed surface within the sleeve body shall be used due to variances in the manufactured outside diameter of the asbestos cement pipe.
3. Tapping sleeve shall have an outlet flange per ANSI B16.1, Class 125 standard.
4. The Contractor shall determine the outside diameter of the existing main before ordering the sleeve.
5. Tapping valves shall be mechanical joint outlet, non-rising stem, resilient seated gate valves meeting the applicable requirements of ANSI/AWWA C509/C515 and C550 with a minimum design working pressure of 200 psi.
6. Tapping valves shall be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made.
7. Tapping valves shall be manufactured with an integral tapping flange having a raised lip design.
8. Tapping valves shall be furnished with a combination flange and mechanical joint for connecting the branch to the main.

O. Valve Boxes

1. All valves shall be equipped with valve boxes. The valve boxes shall be heavy, roadway type boxes. The valve box cover shall be marked "SEWER VALVE" or "SEWER".
2. Valve box materials shall conform to the requirements and standards set forth in The Facility Owner's Standard Specifications.

3. The valve boxes shall be adjustable up or down from the nominal required cover over the pipe. Extensions shall be provided as necessary. A precast concrete ring shall be placed around the valve box opening when outside of paved areas.

4. Valves shall be furnished with extension stems as necessary to bring the operating nut to within 24 inches (600 mm) minimum of the top of the valve box.

P. Tapping Saddles

1. Tapping saddles shall have ductile iron or bronze body with stainless steel, double-tie straps and nuts with pressure rating not less than that of the pipe to which it is to be connected.
2. Saddles shall have a rubber gasket cemented to the body with compatible threading between the saddle and corporation stop. Saddles shall conform to ANSI/AWWA C800 standards.
3. The tapping saddle shall provide full support around the circumference of the pipe, providing a bearing area of sufficient width so that pipe will not distort when the saddle is tightened.

Q. Concrete Vault

1. Concrete vaults shall conform to the requirements and standards set forth in The Facility Owner's Standard Specifications and standard details.

R. Air Release Valves

1. Air release, air/vacuum valves, and combination air valves shall be suitable for use with wastewater and manufactured in compliance with ANSI/AWWA C512.
2. Air release valves shall have a small venting orifice to vent the accumulation of air and other gases in the line or system under pressure.
3. Air/vacuum valves shall have a large venting orifice to permit the release of air as the line is filling or relieve the vacuum as the line is draining or is under negative pressure
4. Combination air valves shall have operating features of both the air/vacuum valve and air release valve.
5. Valves shall be suitable for pressures up to 250 psi.
6. Air release, air/vacuum valves, and combination air valves shall conform to the requirements and standards set forth in The Facility Owner's Standard Specifications and standard details.

S. Thrust Collars and Thrust Blocks

1. Concrete used for thrust collars or thrust blocks on force mains shall meet the "Class A" requirements for concrete listed in Section 500.
2. Thrust collars shall include welded-on collars attached by the pipe manufacturer or retainer glands. Concrete shall be poured continuous around the pipe and bear against undisturbed earth.
3. Reinforcing steel shall meet the requirements set forth in the Plans or The Facility Owner's Standard Specifications.
4. Mechanical joint restraints shall be utilized in lieu of thrust blocks with the approval of the Utility Owner.

T. Manholes

1. Manholes shall be precast concrete or as indicated in the Plans and per The Facility Owner's Standard Specifications.

2. The minimum diameter for manholes shall be 48 inches (1200 mm). The minimum diameter for inside drop manholes shall be 60 inches 1500 mm). Manhole Types and Classes are described in Section 668.
3. Precast reinforced manholes shall be manufactured in accordance with ASTM C478 and shall have a minimum wall thickness of 5 inches (127 mm). All concrete shall have a minimum compressive strength of 4,000 psi when tested in accordance with ASTM C478.

4. The bases shall be monolithically cast and shall consist of a manhole bottom and a wall which shall extend a minimum of 6 inches (150 mm) above the top of the highest in-flowing sewer. The top of the base section shall be tongue and groove section.
5. There shall be a minimum distance of 6 inches (150 mm) between the invert of the lowest out flowing sewer and floor of the precast base to provide for the construction of a formed invert and bench wall within the manhole. There shall be a minimum 0.05-foot drop between the inlet and outlet inverts. Inverts shall be constructed of 4,000 psi plant mix concrete. Bench shape and discharge of force mains into manholes shall conform to the requirements of the Georgia EPD Guidelines for Sewage Collection Systems.
6. Joints between precast sections shall be sealed by means of rubber O-ring gaskets or flexible butyl rubber sealant.
7. Manholes shall have factory applied coatings on the interior and exterior. Surface preparation and coating application shall comply with the manufacturer's recommendations.
8. Manhole sections shall be rejected if abused during shipping or placement and if pipe openings are not properly aligned.
9. A protective coating or lining for corrosion protection shall be applied to all interior surfaces of manholes when called for in the Plans or The Facility Owner's Standard Specifications.
10. Pipe entry holes shall be either precast or cored. Connections between reinforced concrete manhole structures and sewer pipe shall be flexible connectors conforming to ASTM C 923 latest revision.
11. Frame and covers shall be cast or ductile iron and set in a bed of mortar on the top of the manhole and flush with finished grade. Covers shall be marked as indicated in the Utility Owner standard details.
12. Watertight manhole rings and covers are to be used if the manhole is located within the 100-year floodplain boundary or may be flooded by street runoff.
13. Riser adjusting rings shall be a minimum of 3 inches (80 mm) on cone sections. Manhole adjustment rings shall be sealed with a flexible rubber seal.
14. Drop manhole: Inside or outside drop inlets shall be provided into sanitary sewer manholes for incoming lines having inverts 2 feet (0.6 m) or more above the inverts of the manhole outlet lines. Drop pipes shall be the same size as the sewer that they serve. Openings in walls of precast concrete manholes for outside drop connections shall not be made at joints. Outside drop piping materials and encasement/embedment shall be as indicated in the Plans. Concrete used to encase the outside drop piping shall be 4,000 psi plant mix concrete unless otherwise indicated on the Plans.

660.2.02 Delivery, Storage, and Handling

A. Handle pipe, fittings, valves, and accessories carefully to prevent damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings, and appurtenances.

B. To unload pipe, carefully lift and lower it into position using approved padded slings, hooks, or clamps. Furnish equipment and facilities for unloading, handling, distributing, and storing pipe, fittings, valves, and accessories. Make equipment available at all times for use in unloading. Do not roll, drop or dump materials. Any materials dropped or dumped shall be subject to rejection without additional justification.

C. Stored materials including salvaged materials shall be kept in suitable areas safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Store and support plastic pipe to prevent sagging and bending. Store plastic pipe and gaskets to prevent exposure to direct sunlight. Valves shall be stored and protected from damage by freezing.

D. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete.

660.3 Construction Requirements

660.3.01 Personnel

A. General Provisions 101 through 150.

B. Construction and installation of all wastewater utilities shall be performed by a Contractor prequalified/registered with GDOT.

C. All work specified in this section shall be performed by a Contractor with a valid Utility Contractor's license issued by the State of Georgia. Sewer service line installation shall be performed by either a Utility Contractor licensed in the State of Georgia or by a Master Plumber licensed in the State of Georgia.

660.3.02 Equipment

A. Ensure all equipment used is in conformance with the requirements and standards set forth in The Facility Owner's Standard Specifications.

660.3.03 Preparation

General Provisions 101 through 150.

660.3.04 Fabrication

General Provisions 101 through 150.

660.3.05 Construction

A. Finding Existing Underground Utilities and Obstructions

1. Comply with Subsection 107.13 and Subsection 107.21.
2. According to the best information available to GDOT, all known sewer lines, water lines, gas lines, telephone conduits, drainage structures, etc. are shown on the Plans. However, to find such installations, use an electronic pipe and cable finder for locating existing installations or obstructions to the work.
3. Obtain approval from GDOT Project Manager and the Utility Owner prior to disruption of wastewater services required for the installation of the facilities shown on the project Plans.

B. Jack and Bore

Comply with Section 615 for sewer main installations by jack and bore.

C. Directional Drilling

1. Install sewer mains and services by means of directional drilling at locations shown on the Plans or where approved by GDOT or Utility Owner. Provide submittals and follow all relevant procedures and requirements set forth in The Facility Owner's Standard Specifications.
2. The Contractor shall not initiate horizontal directional drilling until all submittals are received, reviewed, and accepted by GDOT and the Utility Owner, and all required permits are obtained.
3. The Contractor shall select drilling additives and fluid mixture proportions to ensure continuous circulation, bore stability, reduce drag on the pipe, and completely fill the annular space between the bore and the pipe to ensure stability and control settlement.
4. The Contractor shall submit contingency plans for remediation of potential problems that may be encountered during the drilling operations. The contingency plans shall address the observations that would lead to the discovery of the problem and the methods that would be used to mitigate the problem. Potential problems that shall be addressed include:
    a. Loss of returns/loss of circulation of drilling fluid.
    b. Encountering obstruction during pilot bore or reaming/pullback.
    c. Drill pipe or product pipe cannot be advanced.
    d. Deviations from design line and grade exceed allowable tolerances.
    e. Drill pipe or product pipe broken off in borehole.
    f. Product pipe collapse or excessive deformation occurs
    g. Utility strike.

h. Hydrolock occurs or is suspected.

i. Excessive ground settlement or heave of ground surface or existing utilities.

j. Inadvertent returns/hydrofracture or surface spills resulting in drilling fluids entering water or reaching the surface.

5. Pipe damaged in directional drilling operations shall be removed and replaced at no additional expense to GDOT or the Utility Owner.

6. Voids developed or encountered during the installation operation shall be pressure grouted with a grout mix approved by GDOT.

7. Installation shall include a locatable conduit system, with identification markers on each side of GDOT right-of-way where applicable. Two (2) insulated 8 gauge solid copper tracers wire shall be attached to the leading end of the pipe pulling head and shall extend the full length of the installed pipe.

8. The location and alignment of the pilot drill progress shall be continuously monitored for compliance with the proposed installation alignment and for verification of the depth of the bore. Monitoring shall be accomplished by computer generated bore logs which map the bore path based on x, y, z coordinate information provided by the locating/tracking system. Readings or plots shall be obtained on every drill rod, and shall be provided to the Inspector on a daily basis. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed tolerances specified elsewhere, such occurrences shall be reported immediately to GDOT. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

9. Upon completion of the directional drill the Contractor shall furnish GDOT and the Utility Owner an as-built drawing along with a report of the monitoring of the drilling fluids during the pilot hole and back reamed hole.

10. Drilling fluid pressures, flow rates, viscosity, and density shall be monitored and recorded by the Contractor. The pressures shall be monitored at the pump. These measurements shall be included in daily logs submitted to GDOT. The Contractor shall document modifications to the drilling fluids, by noting the types and quantities of drilling fluid additives and the dates and times when introduced. The reason for the addition of drilling fluid additives or other modifications shall be documented and reported.

11. Management and disposal of drilling fluids shall be the Contractor's responsibility. Excess drilling fluids shall be contained at the entry and exit points until recycled or removed from the site. All drilling fluids shall be disposed of in a manner acceptable to the appropriate local, state and federal regulations. The Contractor's work will be immediately suspended by GDOT whenever drilling fluids seep to the surface other than in the boring entrance or exit pit, or when a paved surface is displaced.

12. Surfaces damaged by the work shall be restored to their preconstruction conditions at no additional cost to GDOT or Utility Owner, and with no increase in contract time.

13. The following items shall be as shown on the Plans, unless otherwise approved in writing by GDOT:
    a. Entry / exit points
    b. Drill entry / exit angles
    c. Pilot bore path
        1) Radius of Curvature
        2) Entry / exit tolerances: Contractor shall be solely responsible for all work necessary to correct excessive deviations from line and grade, including re-drilling, redesigning connections, and acquiring additional easement, at no additional cost to GDOT or Utility Owner and without schedule extension.

14. The pilot bore shall be pre-reamed and reamed using equipment and methods submitted by the Contractor. The Contractor shall completely ream the bore to the final diameter prior to pullback.

15. Pullback: The pipe shall be installed by pulling it into the reamed bore path in a continuous operation, behind a final reaming tool selected by the Contractor. The pipe shall be isolated from excessive torsional and axial stresses by a swivel device with a pre-established breakaway tensile capacity that is lower than the allowable tensile strength of the pipe. The maximum pull (axial tension force) exerted on the pipelines shall be measured continuously and limited

to the maximum allowed by the pipe manufacturer with an appropriate factor of safety so that the pipe or joints are not overstressed. The end of the pipe shall be closed during the pull back operation.

16. Pipelines shall be adequately supported during installation so as to prevent overstressing or buckling. The Contractor shall provide adequate support/rollers along the pipe layout area to support the required length of pipe for the bore. The pipe layout area shall be cleared of all large stones, construction debris, or other foreign objects that could damage the pipe during pullback. The Contractor shall monitor and inspect pipe rollers and method for suspending pipe at entry during the pullback operation to avoid damage to the pipe.
17. The end of the pipe shall be closed during the pull back operation.
18. Each length of pipe shall be inspected and cleaned as necessary to be free of debris immediately before joining.
19. The Contractor shall at all times handle the pipe in a manner that does not overstress or otherwise damage the pipe. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense. The Contractor shall take appropriate steps during pullback to ensure that the pipe and tracer wires will be installed without damage.
20. If necessary, the pipe shall have water added as it enters the bore to achieve neutral buoyancy and reduce pullback loads and to ensure that adequate internal pressure is maintained at all points to counter balance collapse pressures.
21. The Contractor shall cease pullback operations if the pipe is damaged and shall remove the pipe from the bore and repair the pipe using the manufacturer's recommended procedure or replace the damaged pipe before resuming installation.
22. Damage to the pipe resulting from manufacturer defects, installation, or grouting is the responsibility of the Contractor, including costs for replacement and labor and materials. To confirm no damage to the pipe, upon completion of pull back, the Contractor shall pull a sphere or pig through the entire length of the pipeline. The pig shall be one inch less in diameter than the internal diameter of the product pipe, capable of allowing water to pass through it, complete with a pulling cable on either side. If the pig or sphere cannot pass through the pipe, it shall be considered collapsed and damaged.
23. After the carrier pipe is completely pulled through the bore, a sufficient relaxation period as recommended by the pipe manufacturer shall be provided before the final pipe tie-in.
24. The Contractor shall conduct a final hydrostatic test of the installed pipeline. Final test shall be in accordance with these specifications. The Contractor shall repair any defects discovered during this test, and repeat until the pipe passes the test.

D. Excavating Trenches

1. The Contractor shall provide all necessary shoring and bracing materials as required to assure safe working conditions and to protect the excavations. The Contractor shall be required to fully comply with all applicable OSHA Excavation Safety Standards. No separate payment shall be made for any special procedure used in connection with the excavation.
2. Excavate trenches to the proper depth and width as follows:
    a. Trench to Grade: Excavated trench bottoms shall be firm, free from boulders, and conform to the established grade. Limit open trench excavation to a maximum of three 300 feet (90 m) ahead of completed backfill.
    b. Care shall be taken not to over excavate except where necessary to remove unstable material, irregularities, lumps, rock, and projections. Unnecessary over excavation shall be replaced at the Contractor's sole expense and in accordance with Subsection 660.3.05.
    c. Excavation carried below the established grade lines shown or established by the Utility Owner shall be backfilled according to Section 207 and Subsection 660.3.05. Use Class I or Class II Soils (defined in Section 810) and firmly compact the soil.
    d. Where the established grade of a trench is in rock, undercut the bottom of the trench by at least 6 inches (150

mm) beneath the pipe or conduit and the greater of 24 inches (600 mm) wider than the pipe/conduit (12 inches or 300 mm each side) or 42 inches (1050 mm) wide, then backfill and compact according to Subsection 660.3.05.

e. Open cut excavation in pavement and pavement patching shall be according to GA Standard No. 1401. Remove the pavement according to Section 444, except no separate payment shall be made for sawed joints.

f. Dewatering: Remove all water from excavations and maintain the excavations free of water while construction therein is in progress. Provide dewatering equipment as necessary to conform to this requirement. Dewatering procedures must meet all state and local regulatory requirements.

3. Minimum Trench Depth

a. Excavate trenches to provide at least 48 inches (1.2 m) cover depth directly above the pipe to the finished pavement surface, sidewalk, grass, etc. unless indicated otherwise on the Plans or by GDOT Project Manager and Utility Owner. In order to avoid existing utilities, it may be necessary for the pipe to be laid shallower or deeper than the minimum cover specified. At such time the Contractor shall not be allowed extra compensation for additional excavation necessary for deeper installations.

b. Side slopes of the trenches shall be as nearly vertical as practicable. Trenches in excess of 5 feet (1.5 m) deep shall either have the trench sides laid back to conform to OSHA requirements for trench safety, if such area is available within the limits of excavation, or, alternatively, trenches deeper than 5 feet (1.5 m) shall be excavated via trench box or shored and braced.

4. Trench Width: Excavate trenches to uniform widths, wide enough to allow proper installation of pipe, fittings, and other materials, a minimum of 6 inches (150 mm) and a maximum of 12 inches (300 mm) each side of the pipe or conduit.

5. Trench Bell Holes: Excavate bell holes deeply and widely enough to make joints and to allow the pipe barrel to rest firmly on the trench bottom.

6. Trench bottom: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduits. Shape subgrade to provide continuous support of bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits/pipes. Remove projecting stones, tree roots, debris, and sharp objects along trench subgrade. Abrupt changes in grade of the trench bottom shall be avoided. Unless otherwise indicated in the Plans or The Facility Owner's Standard Specifications, trenches for force mains shall be graded to avoid high and low points that necessitate air release valves.

7. Excavations may be excavated and refilled either by hand or by machinery. Hand tool excavation shall be conducted where necessary to protect existing utilities and structures.

8. In the event that unsuitable material is encountered at or below the excavation depth specified or shown on the Plans, GDOT Project Manager shall be notified immediately before proceeding with any additional work. Such material shall be removed and replaced with suitable material in accordance with Section 205.

E. Connecting to Existing Mains

1. Connect to an existing main with the appropriate fittings according to the Plans or The Facility Owner's Standard Specifications and GDOT Project Manager. When making connections under pressure, furnish and use a tapping sleeve and valve assembly or line stop fittings as indicated. Coordinate with Utility Owner 72 hours in advance for wastewater service interruptions and temporary shut-offs. Evening or weekend work may be required to complete direct connections and tie-ins. Connect to existing mains as follows:

a. Before opening new pipeline trenches, locate the various points of connection to be made into existing pipelines. If necessary, uncover pipelines for the Utility Owner and GDOT Project Manager to prescribe the connections and fittings needed.

b. Connect to existing pipelines only to meet operating requirements. Cut existing lines only after obtaining the Utility Owner and GDOT Project Manager's permission.

c. Provide temporary line stops, associated fittings, and bypass pumping as indicated on the Plans and as necessary when cutting and plugging existing sewer mains to prevent service interruptions. Line stop and associated

fittings shall be suitable for working pressures of 250 psi.

d. Connections to existing asbestos cement pipe shall be performed as indicated on the Plans or in The Facility Owner's Standard Specifications. Cutting, removing, handling, and disposing of asbestos cement pipe shall be in accordance with requirements established by EPA, OSHA, GDOT, NIOSH, and the State of Georgia Environmental Protection Division, and any other applicable laws and ordinances.

F. Laying Sewer Mains and Appurtenances

1. Preparing and Handling Pipes
   a. Thoroughly clean the pipe and fittings before laying them. Keep them clean until accepted.
   b. Use suitable tools and equipment. Do not damage the pipe, especially the lining inside the pipe.
   c. Cut pipe in a manner to avoid damage to pipe or lining, leaving a smooth end at right angles to pipe axis. Smooth and bevel edges of cut pipe for push-on, gasket type joints.
   d. Bedding shall be provided as specified by the Utility Owner or pipe manufacturer for the type of conditions encountered. Bedding typically consists of granular soil free of lumps, clods, cobbles, and frozen materials, and shall be graded to a firm-but-yielding surface without abrupt changes in bearing value. Unstable soils and rock ledges shall be undercut from the bedding zone and replaced with suitable material.
   e. Bed pipe on coarse granular material in flat bottom trench with entire pipe barrel bearing uniformly on coarse granular material, except for an approximately 18-inch (450 mm) gap at pipe balance point for sling removal. Hand excavate and backfill as required to provide uniform and continuous bearing and support for the pipe. Do not support pipe on hubs or end bells. Consolidate coarse granular material under and around pipe up to pipe centerline by tamping.
   f. Join pipe with bells facing direction in which laying operation is progressing. Lay pipe upgrade wherever line grade exceeds 10%.
   g. Carefully examine pipe for cracks and other defects and do not lay defective pipe. If pipe or castings appear to be cracked, broken, or defective after laying, remove and replace those sections.
2. Alignment and Gradient
   a. Ensure that pipe alignment and gradient are according to the lines and grades on the Plans. Pressure pipe alignment shall be either straight or deflected to closely follow true curves. Deflect pipe lines only where required, within allowable horizontal and vertical deflection angles according to the manufacturer.
   b. Sewers shall be laid at least 10 feet (3 m) horizontally from any existing or proposed water main. The distance shall be measured edge-to-edge. When local conditions prevent a horizontal separation of 10 feet (3 m), the sewer may, on a case-by-case basis, be laid closer to a water main provided the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches (450 mm) above the top of the sewer.
   c. Maintain a vertical separation of at least 18 inches (450 mm) between the crown of sanitary sewers and the invert of existing or proposed water mains with the sewer main located below the water main.
   d. Where a vertical separation of 18 inches (450 mm) cannot be provided, and the sewer main cannot be relocated to provide adequate clearance, the section of sewer main passing over or under water mains shall be constructed of materials and with joints that are equivalent to water main standards of construction and in accordance with Section 670, or the sewer line shall be encased in a watertight carrier pipe in accordance with Section 670, extending 10 feet (3 m) on both sides of the crossing measured perpendicular to the water main and shall be pressure tested to assure water-tightness to 150 psi prior to backfilling.
3. Special Requirements for Laying Sewer Mains
   a. Excavate, clean, lay, joint, and backfill progressively and uniformly according to these requirements:
      1) Never leave pipe in the trench overnight without completely jointing and capping.
      2) Do not leave completed pipeline exposed in the trench. Backfill and compact the trench as soon as possible after laying, jointing, and testing are complete.
      3) At the close of work each day and when laying pipe, close the exposed end of the pipeline in the trench

with an approved wood or metal head or barrier.

4) If necessary to cover the end of an incomplete pipeline with backfill, close the end of the pipe with a satisfactory cap or plug.

G. Installing Sewer Mains by Open Cut

1. Use the following flexible joints for connections inside the roadway shoulders or curbs and gutters:
   a. Mechanical Joints
      1) When using mechanical joints, thoroughly wash bell sockets, spigots, gland, gasket, nuts, and bolts with soapy water before assembly. Keep these parts wet until the jointing operation is complete.
      2) Tighten nuts within the torque range recommended by the manufacturer. Check the tightening tolerance with a torque wrench.
      3) If effective sealing is not attained at the maximum recommended torque, disassemble, thoroughly clean, and then reassemble the joint.
      4) Do not overstress bolts to compensate for improper installation or defective parts.
   b. Push-On Type Joints
      1) Use push-on joints made according to the manufacturer's recommendations.
      2) Install PVC pipe in accordance with AWWA C605.
      3) Install ductile iron pipe in accordance with AWWA C600.
2. Restraints for pipe joints and fittings shall be provided as specified and as shown on the Plans. Restraints shall be installed per manufacturer's recommendations.
3. Buried ductile iron pipe and fittings shall be polyethylene encased as specified and as indicated on the Plans. Polyethylene encasement tubing shall be secured with polyethylene tape and installed in accordance with ANSI/AWWA C105/A21.5.
4. Unless otherwise specified by The Facility Owner's Standard Specifications, provide pipe detection wire on all non-metallic pipe systems. Tape the tracer wire to the top center of the pipe at intervals which prevent wire displacement during backfilling operations. Stub tracer wire up 6 inches (150 mm) above finished grade at all valves. For splices, use direct bury kits. After backfilling is complete, test electrical continuity of each tracer wire segment and provide test results to Utility Owner and GDOT Project Manager.
5. Install continuous underground warning tape during backfilling of trench for underground water distribution piping. Install 12 inches (300 mm) below finished grade, or 6 inches (150 mm) below subgrade under pavements and walkways, and buried directly over piping.
6. Use pipe cutters when cutting pipe or special castings. Do not use a hammer, chisel, or a cutting torch.
7. Force mains that do not meet minimum depth of cover, vertical clearance requirements, or other installation requirements at special locations (e.g. creek crossings) shall include concrete encasement. Concrete encasement shall be installed per The Facility Owner's Standard Specifications.
8. If HDPE pipe is to be installed where high groundwater table or water surrounding the pipe is expected, precautions shall be taken to provide neutral buoyancy to prevent floatation or a change in alignment.
9. Valves on Sewer Mains: Install and joint gate, plug, and check valves in accordance with AWWA C600. Include the valve box and valve marker where required.
10. Air release valves shall be installed at high elevation points on the force main and at locations indicated on the Plans. Air release valves shall be installed in accordance with manufacturer's recommendations.
    a. Unless specified otherwise in the Plans or The Facility Owner's Standard Specifications, air release valves shall be installed in a shallow manhole or vault. Automatic air relief valves shall not be used in areas where flooding of the manhole or vault may occur.
    b. An isolation valve shall be installed between the air release assembly and the connection to the main.
    c. The Contractor shall furnish and install at no additional cost to GDOT or Utility Owner all necessary fittings for the installation of air release valves at high points.

11. Thrust Collars and Thrust Blocks: If required, furnish materials and install thrust collars or concrete blocking along force mains as indicated in Subsection 660.2.01. Form and pour concrete thrust collars or blocks in accordance with the Plans and The Facility Owner's Standard Specifications. Blocking shall be poured against undisturbed earth and all forms shall be removed before backfilling.
12. Backfilling
    a. Furnish equipment, labor, and when necessary, suitable material to conform with The Facility Owner's Standard Specifications required for backfilling the pipe line trenches according to Section 207, and as follows:
        1) When testing for leaks in open trenches, do not backfill until testing is complete and leaks are eliminated.
        2) When retaining pavement adjacent to trenches, replace removed pavement with the same or better material when approved in accordance with the appropriate Section for the pavement type replaced.
        3) Place backfill on subgrades free of mud, frost, snow, or ice.
        4) Place and compact bedding course on trench bottoms and where indicated. Shape the bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits/pipes.
        5) Backfill shall include Class I or Class II Soils as defined in Section 810 or suitable material that conforms with The Facility Owner's Standard Specifications.
        6) Backfill shall be placed in two stages: first, side fill to a height of 12 inches (300 mm) above the top of pipe; second, overfill to former surface grade. Side fill shall consist of granular material laid in 6-inch (150 mm) layers each consolidated by mechanical tamping and controlled addition of moisture, to a density of 95% as determined by the Standard Proctor test (AASHTO T-99 Method D) or GDT 67. Overfill shall be layered and consolidated to match the entrenched material in cohesion and compaction. The top 12 inches (300 mm) shall be compacted to 100% of specified density. Consolidation by saturation or ponding shall not be permitted.
        7) Soil Moisture Control: Uniformly moisten and aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.
        8) Initial backfill shall be carefully compacted under pipe haunches and evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Place and compact fill and backfill of satisfactory soil to final subgrade elevation. Backfill voids with satisfactory soil while removing shoring and bracing and/or trench boxes.
        9) After backfilling, maintain temporary surface restoration per GA Standard No. 1401 until permanent repaving is complete. No separate payment shall be made for replaced pavement.

H. Installation of Manholes

1. Each manhole location within the trench shall be over excavated to receive a minimum of 8 inches (200 mm) of No. 57 stone to establish a firm foundation for the manhole. Where the excavation reveals an unsuitable foundation, whether rock or muck, the Contractor shall remove unsuitable material and install No. 57 stone in 6-inch (150 mm) lifts to a maximum of 2 feet (0.6 m) as a foundation for the structure.
2. All manholes shall be installed plumb.
3. Horizontal joint sealant protruding into the manhole shall be cut smooth against the interior wall. Interior joints shall not be grouted unless otherwise directed.
4. Exterior wrap shall be installed centered over joints between manhole sections. Exterior manhole wall shall be clean prior to installing wrap.
5. Backfill adjacent to manholes shall be mechanically compacted in 12-inch (300 mm) lifts symmetrically around the perimeter of the manhole up to the frame and cover, and in accordance with Subsection 660.3.05.
6. Manholes shall be set flush with finished pavement grades where located beneath roadways, sidewalks, or other paved surfaces.

7. All lifting holes or equipment mounting holes shall be filled in completely and made watertight per manufacturer's recommendations.

I. Connections to Existing Manholes

1. Whenever new sewers are connected to existing manholes, pipe openings shall be core drilled with approved equipment to accommodate new pipe. Such connections to existing manholes shall be installed in accordance with manufacturer's recommendations for neoprene boot, link seal or equal. All cuts shall be coated with an appropriate protective coating.
2. The bottom of the manhole shall be reworked and shaped to accommodate the new connections.

J. Laying Sewer Laterals and Appurtenances

1. Except as modified in this Section, construct and install sewer laterals according to the Plans and the requirements for laying sewer mains. Install service lines at locations shown on the Plans or where designated by the Utility Owner and GDOT Project Coordinators.
2. Trench depth and backfill cover may be adjusted at the discretion of the Utility Owner and GDOT Project Coordinators to provide at least 18 inches (450 mm) of cover.
3. Install wyes or tees in the locations shown on the Plans for connection of existing or future service lines. Install laterals with proper grade and alignment to the property line shown on the Plans.
4. New laterals shall extend from the sewer main to the edge of the right-of-way (no more than 5 feet (1.5 m) from the edge of the right-of-way line) where they shall be plugged using a stopper of appropriate size. Sewer laterals shall be tapped into sewer trunk lines using the appropriate tapping machine.
5. Laterals shall be bedded and backfilled in accordance with bedding requirements shown on the Plans and specified herein.
6. Lateral connections shall not be made by knocking a hole in the main or manhole, inserting the lateral pipe, and sealing with grout.
7. Unless otherwise indicated in the Plans or The Facility Owner's Standard Specifications , sewer laterals shall be a minimum of 6 inches (150 mm) in diameter and shall extend from the main and terminate with a clean-out constructed at the edge of right-of-way.

K. Cutting and Capping Existing Sewer Mains

Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Plans or directed by The Facility Owner's or GDOT Project Coordinators. Provide a watertight pipe cap or plug and restraint mechanism to seal off existing mains indicated to remain in service. If sewer main is to be abandoned or removed and not specified to be grout filled, seal ends with a pipe cap or plug or with a masonry plug and minimum 6-inch (150 mm) cover of concrete on all sides around the end of the pipe.

1. The Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged.
2. Abandoned manholes and sewer mains larger than 6 inches (150 mm) shall be removed or filled with flowable fill per Section 600 at the locations indicated on the Plans. Air release valves along abandoned pressure pipe shall be plugged prior to grouting. Prior to backfilling, the bottom of the manhole shall be broken up in such a manner that water will readily pass through and all pipes entering the manhole shall be plugged or grout filled. The top portion of the manhole structure shall be removed in order to establish a minimum of 3 feet cover from subgrade or finished grade when not under the pavement and filled with sand or suitable backfill.
3. Sewer mains shall be cleaned prior to placement of flowable fill. Use concrete or grout pumps capable of continuous delivery at planned placement rate with sufficient pressure to overcome friction and fill the sewer main.

L. Cured-In-Place Pipe (CIPP) Liner Installation

1. Work shall only be performed by personnel trained, experienced, and skilled in the CIPP process.
2. Bypass Pumping: Provide bypass pumping for the flow of sewage around the section or sections of pipe designated

for renovation. Accomplish bypass pumping by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole. Pump sizing shall be adequate to handle the flow. Provide bypass pumping during pre-installation and post-installation video inspections and during the CIPP liner installation.

3. Pre-Installation: Inspect pipelines for breaks, obstacles, and service connections by close circuit television (CCTV) and produce permanent video record (DVD). Camera used for inspection shall be equipped with rotating head that is capable of 90 degree rotation for horizontal and 360 degree rotation about its centerline and has a minimum resolution of 400 vertical lines and 460 horizontal lines. Camera shall be operative in 100% humidity. Utilize power winches, TV cable, and power rewinds to move camera through sewer line at a speed less than 30 feet (10 m) per minute. Provide voice over description on the video with stationing of services and areas for point repair indicated on the video. Inspect interior of pipeline to determine existing conditions that may prevent proper installation of the CIPP pipeliner. Designate areas for point repair by evaluating any obstructions that can't be removed by conventional sewer cleaning equipment such as a protruding service connection, dropped joint, or collapse. Confirm locations for all branch service connections. Transfer procession and property rights of the inspection video record to the Utility Owner.
4. Cleaning: Clear the line of all solids and roots. Remove all internal debris from the sewer line to prevent interference with the CIPP. Properly dispose of all debris removed from the sewer line.
5. Point Repair: Excavate and repair any protruding service connection, dropped joint, or collapsed pipe observed during the inspection process.
6. Customer sewer service shall be maintained throughout the duration of the project whenever possible. If maintaining customer sewer service is not possible, limit outage duration for sewer customers to a maximum of 8 hours. Each home or business being affected shall be contacted and informed of the work being conducted, when service will be unavailable, and the duration of the outage. Contact shall be made a minimum of 7 calendar days prior to service outage. Deliver a written notice to each affected home or business a minimum of one business day prior to beginning work informing them when service will be unavailable, the duration of the outage, and a local telephone number for customers to call and discuss any issues.
7. Install CIPP in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6 with the following modifications:
    a. Quantity of resin used for tube impregnation is sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall.
    b. Thorough resin saturation is achieved throughout the length of the felt tube.
    c. Point of vacuum is not further than 25 feet from the point of initial resin introduction.
    d. Vacuum point is no further 75 feet form the leading edge of the resin after a vacuum in the tube is established.
    e. Leading edge of the resin slug is as near to perpendicular as possible.
8. Tube insertion: Position the wetout tube in the pipeline using either inversion or a pull-in method. If pulled into place, utilize power winching equipment suitable for intended purpose and ensure the tube is not damaged as a result of pull-in friction. The tube shall be pulled-in or inverted through an existing manhole or approved access point and shall extend fully to the next designated manhole or termination point.
9. Temperature Monitoring: Place temperature gauges inside the tube at the invert level of each end and monitor the temperature during the CIPP cure cycle.
10. Reopen service connections without excavation.
11. Following installation and reinstatement of service connections, perform post-installation inspection utilizing CCTV requirements for pre-installation.
12. Perform visual inspection of the CIPP pipeliner in accordance with ASTM F1743, Section 8.6.
13. Prepare CIPP pipeliner samples and test physical properties in accordance with ASTM F1216 or ASTM F1743,

Section 8, using either method proposed. Flexural properties shall meet or exceed the values listed in Table 1 of the applicable ASTM. Provide for testing of flexural properties and reporting of test data for each line segment by an independent testing laboratory accredited by AASHTO Accreditation Program.

14. Obtain wall thickness samples for analysis from each line segment installed and at the end farthest from the cure source. Determine wall thickness of samples as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87.5% of the design thickness as specified in Subsection 660.2.01. Provide for testing of wall thickness samples and reporting of test data for each line segment by an independent testing laboratory accredited by AASHTO Accreditation Program.

M. Relocating, Adjusting, and Removing

1. Sewer Valves and Air Release Valves
   a. Relocate, adjust to grade, or remove valves and valve boxes according to the Plans or as designated by the GDOT Project Manager and Utility Owner.
   b. Protect items during removal and relocation. Contractor shall replace lost or damaged Items at no expense to GDOT.
   c. Disconnect each joint before removing items from the trench.
   d. Test for leakage, adjust, and retest until no leaks appear.
   e. Backfill as specified in Subsection 660.3.05.
   f. Consider valve boxes part of the valve assembly and remove them intact with the valve.
2. Existing Valve Boxes
   a. Lower, raise, or relocate existing valve boxes to the location and grade established on the Plans or by the GDOT Project Manager and Utility Owner according to Section 611.
3. Lift Stations
   a. Demolish and install new lift station (if required) as indicated on the Plans.
4. Manholes
   a. Frames and covers shall be removed and manhole shall be adjusted to grade. Adjustment shall be made by adding or removing brickwork, concrete, riser rings, or other materials in accordance with the Plans and The Facility Owner's.
   b. Within roadways, manholes shall be brought to final grade prior to paving. A minimum area of 12 inches (300 mm) wide (from edge of manhole ring) and a minimum of 12 inches deep shall be excavated around the adjusted frame and cover prior to final paving. The excavated area shall be brought to the grade of the roadway base material with a minimum of 3,000 psi concrete in preparation of final paving.
5. Utility related items identified on the Plans to be salvaged are the property of the Utility Owner. Contractor shall coordinate with Utility Owner on delivery of salvaged materials. Should the Utility Owner choose to not accept these materials they shall be removed from the project site as soon as practical.

N. Aerial Crossings

1. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the crossing shall meet all requirements of the agencies that own or have jurisdiction over such structures.
2. Support must be provided for all joints in pipes utilized for aerial crossings. The supports must be installed to prevent frost heave, overturning, and settlement. Precautions against freezing, such as insulation and increased slope, must be provided.
3. Expansion joints shall be provided between above ground and below ground sewers. Where buried sewers change to aerial sewers, construction shall minimize frost heaving.
4. Aerial installations shall avoid or minimize stream blockage during normal high water events.
5. For pressure pipe, underground valves shall be provided at both ends of the aerial crossing so that the section can be isolated for testing or repair. The valves shall be restrained, easily accessible, and not subject to flooding. An air release/vacuum relief valve shall be installed at all high points along the aerial crossing.

6. Appropriate guards shall be installed at both ends of the aerial crossing to prevent public access to the pipe.

660.3.06 Quality Acceptance

A. Materials Certification

For certain products, assemblies and materials, in lieu of normal sampling and testing procedures by the Contractor, the GDOT, and Utility Owner may accept from the Contractor the manufacturer's certification with respect to the product involved under the conditions set forth in the following paragraphs:

1. Material certifications shall be provided to GDOT, who shall distribute to the Utility Owner. Material certifications shall be approved by GDOT and the Utility Owner prior to construction. The certification shall state/specify that the named product conforms to these specifications and requirements of the Utility Owner and GDOT, and representative samples thereof have been sampled and tested as specified.
2. The certification shall either:
    a. Be accompanied by a certified copy of the test results, or on GDOT QPL list, or
    b. Certify such test results are on file with the manufacturer and will be furnished to the GDOT Project Manager and Utility Owner upon demand.
3. The certification shall state/specify the name and address of the manufacturer and the testing agency and the date of tests; and sets forth the means of identification which shall permit field determination of the product delivered to the project as being the product covered by the certification.
4. Submit certification with two copies of the covered product to the GDOT Project Manager, and Utility Owner.
5. GDOT or the Utility Owner will not be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.
6. GDOT and the Utility Owner reserve the right to require samples and test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer. Any materials that fail to meet specification requirements will be rejected.
7. In accordance with the BUY AMERICA requirements of the Federal regulations (23 U.S.C. 313 and 23 CFR 635.410) all manufacturing processes for steel and iron products or predominantly of steel or iron (at least 90% steel or iron content) furnished for permanent incorporation into the work on this project shall occur in the United States. The only exception to this requirement is the production of pig iron and the processing, pelletizing and reduction of iron ore, which may occur in another country. Other than these exceptions, all melting, rolling, extruding, machining, bending, grinding, drilling, coating, etc. must occur in the United States.
    a. Products of steel include, but are not limited to, such products as structural steel piles, reinforcing steel, structural plate, steel culverts, guardrail steel supports for signs, signals and luminaires. Products of iron include, but are not limited to, such products as cast iron frames and grates and ductile iron pipe. Coatings include, but are not limited to, the applications of epoxy, galvanizing and paint. The coating material is not limited to this clause, only the application process.
    b. Records to be provided by the Contractor for this certification shall include a signed mill test report and a signed certification by each supplier, distributor, fabricator, and manufacturer that has handled the steel or iron product affirming that every process, including the application of a coating, performed on the steel or iron product has been carried out in the United States of America, except as allowed by this Section. The lack of these certifications will be justification for rejection of the steel and/or iron product or nonpayment of the work.
    c. The requirements of said law and regulations do not prevent the use of miscellaneous steel or iron components, subcomponents and hardware necessary to encase, assemble and construct the above products, manufactured products that are not predominantly steel or iron or a minimal use of foreign steel and iron materials if the cost of such materials used does not exceed one-tenth of one percent (0.1%) of the total contract price or $2,500.00, whichever is greater.

B. Hydrostatic Testing of Pressure Pipe

1. When the Utility Owner and GDOT Project Manager approve a section of pressure pipe for testing, the Contractor shall furnish the materials, equipment, and labor to conduct the pressure and leakage tests. Use a test pump, pressure gauge, and a means of measuring the water necessary to maintain the required pressure during the prescribed testing time. All pressure and leakage testing shall be done in the presence of the Utility Owner and GDOT Project Manager as a condition precedent to the approval and acceptance of the system. All pipes shall have been thoroughly flushed prior to testing. Simultaneous or separate pressure and leakage tests may be performed.
2. All water for testing and flushing shall be water provided by the Contractor, at no cost to the Utility Owner or GDOT, from an approved source. Flow velocity during line filling shall not exceed 2 feet (0.6 m) per second (fps).
3. Testing Requirements
    a. Force main testing shall be done immediately after installation and backfilling has been completed.
    b. Force mains shall be tested in accordance with the latest revision of AWWA C600 for ductile iron and C605 for PVC under an average hydrostatic pressure of the greater of 1.5 times the maximum working pressure or 150 psi as measured at the lowest point in the system for a minimum of 2 hours. Pressure shall be maintained until all sections under testing have been checked for evidence of leakage.
    c. While the system is being filled with water, air shall be carefully and completely exhausted. If permanent air vents are not located at all high points, the Contractor shall install corporation stops or fittings and valves at such points at no additional expense to the Utility so the air can be expelled as the pipe system is slowly filled.
    d. Makeup water shall be added, as required, to maintain the pressure within 5 psi of the test pressure. The quantity used shall be measured by pumping from a calibrated container. The maximum amount of makeup water allowed shall be determined by the following formula:

$$L = \frac{SD\ P^{0.5}}{148{,}000}$$

in which,

L = Allowable Leakage in gallons per hour

S = Length of pipe being tested in feet

D = Nominal pipe diameter in inches

P = Average test pressure during the test in psi gauge

    e. Visible leaks shall be corrected regardless of total leakage shown by test. All pipe fittings and other materials found to be defective under test shall be removed and replaced. Lines which fail to meet test requirements shall be repaired and retested as necessary until test requirements are met. No additional compensation shall be made for repairs or retesting.

C. Alignment Testing

1. Straight alignment of gravity sewers shall be checked by either using a laser beam or lamping. Each segment between manholes shall show at least 90% of the full pipe circle visible when looking from manhole to manhole.

D. CCTV Inspection

1. All new gravity sewers shall be inspected via closed-circuit televising (CCTV) in accordance with The Facility Owner's Standard Specifications. The Contractor shall thoroughly clean the entire sewer system by jetting or applicable methods prior to the TV inspection. If conditions indicate repairs are necessary, re-televising may be required. The initial inspection shall be scheduled with the Utility Owner and GDOT Project Manager when the Contractor advises that all sewer lines are ready for testing.

2. All TV inspections shall be performed by persons and/or firms qualified in such work.
3. The Contractor shall provide the TV inspection deliverables according to the format indicated in The Facility Owner's Standard Specifications.

E. Manhole Vacuum Testing

1. A vacuum test shall be performed on each manhole to assure water-tightness in accordance with ASTM C1244. The manholes shall be tested separately from sewer lines.
2. If the manhole fails the initial test, necessary repairs shall be made at the Contractor's expense and the manhole retested until a satisfactory test is obtained.

F. Deflection Testing

Utility Owner may require deflection tests utilizing a mandrel to be performed on flexible gravity sewer pipes. Deflection tests shall be conducted after the final backfill has been in place to permit stabilization of the soil-pipe system and follow the requirements of The Facility Owner's Standard Specifications. No mechanical pulling devices shall be used. All pipes not passing this mandrel shall be re-laid or replaced by the Contractor at no additional cost to GDOT or Utility Owner.

G. Leakage Testing

1. The Contractor shall conduct tests to determine the water-tightness of gravity sewers when completed. The Utility Owner shall observe the tests with the Contractor furnishing all required labor, equipment, and materials.
2. Sewers shall be tested in sections with each section extending between two adjacent manholes or from the end of the sewer to the nearest manhole. The Contractor shall utilize an infiltration test, an exfiltration test, or a low pressure air test at the direction of the Utility Owner and in accordance with The Facility Owner's Standard Specifications.
    a. Infiltration: Each section shall be covered with no less than two feet (0.6 m) of water above the top of the pipe at the highest point. The infiltration will be measured by means of a weir located in the downstream manhole. The pressure head of 2 feet (0.6 m) shall be maintained for a period of not less than 24 hours before the weir measurements are made.
    b. Exfiltration: The sewer at the upstream side of the lower manhole and the upstream side of upper manhole in each section shall be closed with a watertight bulkhead and the sewer filled with water until the water elevation in the upstream manhole is not less than two feet (0.6 m) above the top of the sewer pipe or two feet (0.6 m) above ground water elevation in the trench, whichever is higher. The exfiltration will be determined by measuring the amount of water required to maintain the above stated water elevation for a period of one hour from the start of the test. The entire length of section to be tested shall be filled and maintained full of water for a period of approximately 24 hours prior to the start of the test.
    c. The amount of exfiltration or infiltration shall not exceed 50 gallons per inch of pipe diameter per 24 hours per mile of sewer in each and every section tested in accordance with the above.
    d. In the event the allowable leakage rates are not met, the Contractor shall determine the location(s) where excess water is entering or leaving the sewer. The sewer and/or the manholes shall be repaired and retested until the leakage in the sewer is within the allowable limits.
3. Air test: Low pressure air testing shall be completed to detect leaks in sewers where hydrostatic testing is not practical. The Contractor shall perform the low pressure air test as specified in ASTM C924 for concrete and Uni-Bell UNI-B-6-98 for plastic pipe.

660.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

660.4 Measurement

Incidentals including excavation, rock removal, backfilling, flushing, testing, temporary water connections, pavement removal, pavement replacement, and other incidentals required for the installation of sanitary sewer items are not measured for separate payment and shall be included in the applicable Pay Items below. Gravity sewer mains, manholes, force mains, and laterals, and associated items of work in this Specification, complete, in place, and accepted, are measured for payment as follows:

A. Ductile Iron Sewer Main

Ductile iron sewer mains shall be measured in linear feet (meters) for each size and thickness class installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

B. PVC Sewer Force Main

PVC sewer mains shall be measured in linear feet (meters) for each size and thickness installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

C. PVC Sewer Gravity Main

PVC sewer mains shall be measured in linear feet (meters) for each size and thickness installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

D. Fusible PVC Sewer Main

Fusible PVC sewer mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

E. HDPE Sewer Main

HDPE sewer mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

F. Concrete Sewer Main

Concrete sewer mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

G. Ductile Iron Fittings

Ductile iron fittings shall be included in the overall pipe measurements acceptably installed. This Item includes, but is not limited to, wyes, tees, bends, crosses, sleeves, plugs and caps, and reducers.

H. Restrained Joints

Joint restraints used with the installation of PVC or ductile iron pipe shall be included in the overall pipe measurements acceptably installed on the number of each size restraint device installed.

I. Manholes

Manholes shall be measured on an individual basis on the depth and type of manhole acceptably installed in accordance to Section 668.

I. Drop Manholes

Drop Manholes shall be measured on an individual basis on the depth and type of manhole acceptably installed in accordance to Section 668.

J. Connection to Existing Manholes

Connections to existing manholes shall be included in the Contract price for sewer line connection acceptably installed.

K. Gate Valves

Gate valves shall be measured on an individual basis for each size valve and box assembly acceptably installed.

L. Check Valves

Check valves shall be measured on an individual basis on the number of each size valve and box assembly acceptably installed.

M. Plug Valves

Plug valves shall be measured on an individual basis on the number of each size valve and box assembly acceptably installed.

N. Tapping Sleeve and Valve Assembly

Tapping sleeve and valve assemblies shall be measured on an individual basis on the number of each size tapping sleeve and valve assembly acceptably installed.

O. Sewer Laterals

Sewer laterals shall be measured on an individual basis on the size of lateral acceptably installed.

P. Cleanouts

Sewer laterals shall be measured on an individual basis on the number of each cleanout acceptably installed.

Q. Air Release Valve Assemblies

Air release valve assemblies shall be measured on an individual basis on the number of each size and type of air release valve assembly acceptably installed.

R. Steel Casing

Steel casing pipe of the wall thickness and diameter specified shall be measured by the linear foot for each size and thickness of steel casing pipe installed. Measurement shall be horizontally above the centerline of the casing.

S. Relocation of Existing Air Release Valves

Relocation of existing air release valves shall be measured on an individual basis on the number of each acceptably relocated.

T. Adjustment of Existing Valve Boxes to Grade

Adjustment of existing valve boxes adjusted to grade in their original locations shall be measured on an individual basis on the number of each valve box acceptably adjusted in accordance with section 611.

U. Removal of Air Release Valves

Removal of existing air release valves shall be measured on an individual basis on the number of each removed.

V. Removal of Manholes

Removal of existing manholes shall be measured on an individual basis on the number of each manhole removed in accordance to Section 610.

W. Adjustment of Manholes

Adjustment of existing manholes adjusted to grade in their original locations shall be measured on an individual basis on the number of each manhole acceptably adjusted in accordance to Section 611.

X. Reconstruct Manhole

Reconstruction of existing manholes to grade in their original locations shall be measured on an individual basis on the number of each acceptably reconstructed manhole in accordance to Section 611.

Y. Adjustment of Cleanout

Adjustment of cleanouts to grade shall be measured on an individual basis on the number of each cleanout acceptably adjusted in accordance to Section 611.

Z. Concrete Thrust Blocks

Concrete thrust blocking installed shall be measured as indicated in Section 500 per cubic yard of concrete acceptably installed. When Concrete Thrust Blocks is not shown as a pay item, include the cost of the work in the bid price for the sewer pipe.

AA. Concrete Thrust Collars

Thrust collars shall be measured on an individual basis on the number of each size thrust collar acceptably installed. When Concrete Thrust Collars is not shown as a pay item, include the cost of the work in the bid price for the sewer pipe.

BB. Cut and Plug Sewer Main

Cutting and plugging of sewer mains shall be measured on an individual basis per each instance of cutting and plugging existing mains as shown on the Plans.

CC. Removal of Sewer Mains

Removal of sewer mains shall be measured per linear foot for each size pipe actually removed in accordance to Section 610. Measurement shall be horizontally above the centerline of the pipe removed and shall include the length of valves and fittings.

DD. Line Stop

Line stops shall be measured on an individual basis on the number of each size line stop actually installed.

EE. Flowable Fill

Flowable fill shall be measured as indicted in Section 600 per cubic yard of flowable fill acceptably installed. When flowable fill is not shown as a pay item, include the cost of the work in the bid price for the appropriate item.

FF. Cured-In-Place-Pipe (CIPP) Liners

CIPP liners shall be measured per linear foot for each size CIPP installed. Measurement shall be horizontally above the centerline of the host pipe from center of manhole to center of manhole.

GG. Insertion Valve

Insertion valves shall be measured on an individual basis on the number of each size valve acceptably installed.

HH. Closed Circuit Television (CCTV) Inspection

CCTV inspection shall be measured per linear foot of CCTV inspection price to be included in the Contract price for sewer pipe acceptably performed.

II. Three-Dimensional (3D) Survey

Three-dimensional survey shall be measured as one lump sum for a complete and accepted survey price to be included in the Contract price for sewer pipe acceptably performed.

660.4.01 Limits

General Provisions 101 through 150.

660.5 Payment

The Contract Unit Price for each Item, complete and accepted, shall include all costs incidental to the construction of the item according to the Plans and as specified in this Section. The unit prices bid shall include due allowance for the salvage value of all materials removed from existing or temporary lines and not installed in the completed work. All such surplus items shall become the property of the Contractor unless such surplus items are specified to be salvaged.
Payment for any item listed below is full compensation for the Item or Items complete in place.

A. Ductile Iron Sewer Mains

Ductile iron sewer mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover

the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, joints and jointing materials, anchoring, warning tape, polyethylene encasement, protection of existing utilities, connections to existing mains, flushing, backfilling, backfill materials, disposal of unsuitable backfill material, clean backfill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pipe into service.

B. PVC Force Main

PVC sewer mains shall be paid for at the unit price per linear foot for each diameter and thickness pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, joints and jointing materials, anchoring, tracer wire, warning tape, protection of existing utilities, connections to existing mains, flushing, backfilling, backfill materials, disposal of unsuitable backfill material, clean backfill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pipe into service.

C. PVC Gravity Main

PVC sewer mains shall be paid for at the unit price per linear foot for each diameter and thickness pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, joints and jointing materials, tracer wire, warning tape, protection of existing utilities, connections to existing mains, flushing, backfilling, backfill materials, disposal of unsuitable backfill material, clean backfill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pipe into service.

D. Fusible PVC Sewer Main

Fusible PVC sewer mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, entry/exit pits, installation of pipe, joints and jointing materials, tracer wire, warning tape, mechanical joint adapters, protection of existing utilities, connections to existing sewer mains, fusion process materials and equipment, directional drilling materials and equipment, tracking system, assembling, welding, supporting, stringing, pulling, pigging, cleaning, flushing, backfilling, backfill materials, disposal of unsuitable backfill material, clean backfill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, and restoration, and all incidentals necessary to place the pipe into service except where such items are shown to be paid for under a separate Pay Item.

E. HDPE Sewer Main

HDPE sewer mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, entry/exit pits, installation of pipe, tracer wire, warning tape, mechanical joint adapters, protection of existing utilities, connections to existing mains, fusion process materials and equipment, directional drilling materials and equipment, tracking system, assembling, welding, supporting, stringing, pulling, pigging, cleaning, flushing, backfilling, disposal of unsuitable backfill material, clean backfill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, and restoration, and all incidentals necessary to place the pipe into service except where such items are shown to be paid for under a separate Pay Item.

F. Concrete Sewer Main

Concrete sewer mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, anchoring, tracer wire, warning tape, protection of existing utilities, connections to existing mains, flushing, backfilling, backfill materials, disposal of unsuitable backfill material, clean backfill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pipe into service.

G. Ductile Iron Fittings

Ductile iron fittings will not be paid for separately but shall be included in the overall pipe measurements acceptably installed each fitting as denoted in the manufacturers' catalogues and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of fittings, joints and jointing materials, anchoring,

warning tape, polyethylene encasement, protection of existing utilities, flushing, backfilling, backfill materials, disposal of unsuitable backfill material, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, all other related and necessary materials, work, and equipment required to install a complete and operable pipeline fitting. This Item includes, but is not limited to, wyes, tees, bends, crosses, sleeves, plugs and caps, couplings, and reducers.

H. Restrained Joints

Restrained joints not be paid for separately but shall be included in the overall pipe measurements acceptably installed each fitting as denoted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting, shoring, installation of the restraint device, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the restrained joint.

I. Gate Valves

Gate valves shall be paid for at the unit price per each size gate valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the gate valves including valve box, concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service.

J. Plug Valves

Plug valves shall be paid for at the unit price per each size plug valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the butterfly valves (including valve box), concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the plug valve and place it in service.

K. Check Valves

Check valves shall be paid for at the unit price per each size check valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the check valves, concrete vault or manhole, concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration and all work and materials necessary to install the check valve and place it in service.

L. Tapping Sleeve and Valve Assembly

Tapping sleeve and valve assemblies shall be paid for at the unit price per each size tapping sleeve and valve assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of tapping sleeves and valve assemblies including valve box, concrete pad or collar, valve marker, polyethylene encasement, protection of existing utilities, tapping the force main, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and necessary hardware to install the tapping sleeve and valve assembly and place it in service.

M. Manholes

Sanitary sewer manholes shall be paid for at the unit price in accordance to Section 668 ,according to the depth and type of each manhole installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of manholes including ring and covers, inverts, coatings, protection of existing utilities, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the manhole and place into service.

N. Drop Manholes

Sanitary sewer drop manholes shall be paid for at the unit price per each manhole installed in accordance to Section 668 and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of manholes including ring and covers, inverts, coatings, outside drop piping and fittings, concrete encasement, protection of existing utilities, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the manhole and place into service.

O. Connections to Existing Manholes

Connections to existing manholes shall be paid for in the Contract Price for sewer pipe and shall cover the cost for all material, transportation, labor, equipment, excavation, sheeting and shoring, installation of manhole connection, rework of inverts, grout, coatings, protection of existing utilities, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to acceptably install the manhole connection.

P. Sewer Laterals

Sewer laterals shall be paid for at the unit price per size of each size installed to the property line and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, piping, installation of sewer lateral including connection to existing pipe, cleanout, cleanout marker, fittings including wyes, bends, pipe, cap with screw plug, tracer wire, casting, concrete collar or pad, valve box and cover, bypass pumping (as required), protection of existing utilities, backfilling, backfill materials, disposal of unsuitable backfill material, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the sewer lateral into service.

Q. Cleanouts

Sewer cleanouts shall be paid for at the unit price per each cleanout installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, piping, installation of cleanout including connection to existing pipe, fittings including wyes, bends, pipe, cap with screw plug, tracer wire, casting, concrete collar or pad, valve box and cover, bypass pumping (as required), protection of existing utilities, backfilling, backfill materials, disposal of unsuitable backfill material, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the cleanout into service.

R. Air Release Valve Assembly

Air release valves shall be paid for at the unit price per each size and type of air release valve installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the air release assembly, tapping saddle, isolation valve, reducers, piping, restraints, fittings, tracer wire, concrete manhole or vault, protection of existing utilities, backfilling, backfill materials, disposal of unsuitable backfill material, clean fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the air release assembly into service.

S. Steel Casing

Steel casing pipe shall be paid for at the unit price per linear foot according to the diameter and thickness of the steel casing installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, steel casing pipe, skid, steel straps, coatings, casing spacers, end seals, boring and jacking pits, backfilling, backfill materials, disposal of unsuitable backfill material, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the steel casing except where such items are shown to be paid for under a separate Item. The carrier pipe shall be paid for as a separate Pay Item.

T. Relocation of Existing Air Release Valves

Relocation of air release valves shall be paid for at the unit price per each air release valve assembly relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing air

release valve assembly, installation at location indicated in Plans, piping, restraints, tracer wire, fittings, adjustment to final grade, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove, and relocate the air release valve except where such items are shown to be paid for under a separate Pay Item.

U. Adjustment of Existing Valve Boxes to Grade

Adjustment of existing valve boxes shall be paid for which shall be paid for in accordance with Section 611, at the unit price per each valve box adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, valve case and lid, trench adapter and operating nut extensions/reductions, tracer wire and splices, tracer wire riser and threaded plug, concrete pad, valve identification disc, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the valve box.

V. Adjustment of Existing Manhole

Manhole tops to be raised or lowered 2 feet (0.6 m) or less are considered adjustment of existing manholes, which shall be paid for in accordance with Section 611, at the unit price per each manhole adjusted to final grade and shall cover the cost of all materials, including new ring and covers for sanitary manholes, transportation, labor, equipment, plugs, riser sections, brick and mortar, adjustment rings, excavation, sheeting and shoring, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to install the new ring and cover and adjust to final grade.

W. Reconstruct Existing Manhole

Manhole tops to be raised between 2 feet (0.6 m) and 6 feet (1.5 m), or tops to be lowered more than 2 feet (0.6 m) are considered the reconstruction of an existing manhole, which shall be paid for which shall be paid for in accordance with Section 611, at the unit price per each manhole adjusted to final grade and shall cover the cost of all materials, including new ring and covers for sanitary manholes, transportation, labor, equipment, plugs, riser sections, brick and mortar, excavation, sheeting and shoring, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to reconstruct the manhole. Tapping a new pipeline into an existing manhole is not considered reconstruction.

X. Adjustment of Cleanout

Adjustment of cleanouts shall be paid for at the unit price per each cleanout adjusted to finished grade and shall cover the cost of all materials, including transportation, labor, equipment, excavation, sheeting and shoring, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to adjust the cleanout to final grade.

Y. Removal of Manhole

Removal of manholes shall be paid for which shall be paid for in accordance with Section 610, at the unit price per each manhole removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work necessary to remove and dispose of manholes including ring and covers.

Z. Removal of Air Release Valve

Removal of air release valves shall be paid for which shall be paid for in accordance with Section 610, at the unit price per each air release valve removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of air release valve assemblies, piping, manholes, concrete vaults and fabricated enclosures, backfilling, backfill materials, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of air release valves identified to be salvaged,

and all work necessary to remove the air release valve.

AA. Concrete Thrust Blocks

Concrete thrust blocks shall be paid for at the unit price per cubic yard of concrete complete in place as indicated in Section 500 and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, concrete, forming, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install a complete thrust block. Concrete Thrust Blocks is not shown as a pay item; include the cost of the work in the bid price for the sewer pipe.

BB. Concrete Thrust Collars

Concrete thrust collars shall be paid for at the unit price per each size of thrust collar and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, reinforced concrete thrust collars, retainer glands, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install a complete thrust collar. Concrete Thrust Collars is not shown as a pay item; include the cost of the work in the bid price for the sewer pipe.

CC. Removal of Sewer Mains

Removal of sewer mains shall be paid for which shall be paid for in accordance with Section 610, at the unit price per linear feet (meters) of the size of sewer main to be removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to locate, remove and dispose of the pipe and associated appurtenances. Unless indicated for removal as a separate Pay Item, appurtenances to be removed shall include but not be limited to fittings, isolation valves, air release valves, valve boxes, steel casings, casing spacers, service laterals, thrust blocks, and concrete. All such surplus items shall become the property of the Contractor unless specified to be salvaged by the Utility Owner.

DD. Cut and Plug Existing Sewer Main

Cutting and plugging of existing sewer mains shall be paid for at the unit price per each installation and shall cover all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to cut and plug existing sewer mains except where such items are shown to be paid for under a separate Pay Item.

EE. Line Stops

Line stops shall be paid for at the unit price per each size line stop installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the line stop assemblies, valves, valve boxes, fittings, restraints, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service.

FF. Flowable Fill

Flowable fill shall be paid for at the unit price per cubic yard of flowable fill installed as indicated in Section 600 and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, flushing, plugging air release valves and service connections, installation of flowable fill, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to complete the installation. When flowable fill is not shown as a pay item for the sewer items, include the cost of the work in the bid price for the appropriate item.

GG. Cured-In-Place-Pipe (CIPP) Liner

CIPP liners shall be paid for at the unit price per linear foot and diameter of liner acceptably installed and shall cover the cost for all materials, transportation, labor, equipment, bypass pumping, cleaning, root removal, flushing, coordination with and protection of existing utilities, distributing project notices, removal of protruding service connections, supplying and installing liner, reinstatement of service connections, inspection, testing, clean-up, restoration, and all work and materials necessary to complete the liner installation including incidentals and associated labor for which payment is not provided under a separate Pay Item. Point repairs shall be paid for under the unit price per linear foot of the diameter and material of pipe being replaced.

HH. Insertion Valve

Insertion valves shall be paid for at the unit price per each size valve inserted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the valve, valve boxes, fittings, restraints, concrete pad or collar, valve identification disc, valve marker, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean fill, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the insertion valve and place it in service.

II. Closed Circuit Television (CCTV) Inspection

CCTV inspection shall be included in the Contract price for sewer pipe inspection acceptably performed and shall cover the costs for all materials, transportation, labor, equipment, excavation, sheeting, shoring, bypass pumping, protection of existing utilities, CCTV inspection, CDs / DVDs, inspection reports, clean-up, restoration, and all work and materials necessary to perform the CCTV inspection.

JJ. Three-Dimensional (3D) Survey

Three-dimensional survey shall be price to be included in the Contract price for sewer pipe, and shall cover the costs for all non-destructive methods of locating installed utilities and associated electronic deliverables per Utility Owner specifications.

Payment will be made under:

Item No. 660	Sewer Force Main, _____in (mm)	Per linear foot (meter)
Item No. 660	Sewer Gravity Main, _____in (mm)	Per linear foot (meter)
Item No. 660	Sewer Main, Ductile Iron, _____in (mm)	Per linear foot (meter)
Item No. 660	Sewer Main, Fusible PVC, _____in (mm)	Per linear foot (meter)
Item No. 660	Sewer Main, HDPE,_____in (mm)	Per linear foot (meter)
Item No. 660	Sewer Main, Concrete, _____in (mm)	Per linear foot (meter)
Item No. 660	Cured-in-Place Pipe (CIPP) Liner, _____in (mm)	Per linear foot (meter)
Item No. 660	Sewer Main, _____in (mm)	Per linear foot (meter)
Item No. 660	Steel Casing, in (mm)	Per linear foot (meter)
Item No. 660	Cleanouts, in (mm)	Per each
Item No. 660	Tapping Sleeve and Valve Assembly, in (mm)	Per each
Item No. 660	Relocation of Existing Air Release Valve Assembly, _____in (mm)	Per each
Item No. 660	Removal of Air Release Valve, _____in (mm)	Per each
Item No. 660	Cut and Plug Sewer Main, _____in (mm)	Per each

Item No. 660	Concrete Thrust Collar, _____in (mm)		Per each
Item No. 660	Gate Valve,	in (mm)	Per each
Item No. 660	Check Valve,	in (mm)	Per each
Item No. 660	Plug Valve,	in (mm)	Per each
Item No. 660	Insertion Valve,	in (mm)	Per each
Item No. 660	Air Release Valve Assembly,	in (mm)	Per each
Item No. 660	Sewer Lateral,	in (mm)	Per each
Item No. 660	Line Stop,	in (mm)	Per each

660.5.01 Adjustments

General Provisions 101 through 150.

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

PROJECT: 0010195

COUNTY: Lumpkin

P.I.: 0010195

Section 670—Water Distribution System

Delete Section 670 and substitute the following:

670.1 General Description

This work consists of furnishing materials, labor, tools, equipment, and other items necessary for installing, removing, abandoning, relocating, and adjusting water distribution systems according to the Plans and Specifications.

670.1.01 Definitions

A. General Provisions 101 through 150

B. The term "The Facility Owner" shall be understood to mean "City of Dahlonega".

C. The term "Project Manager" shall mean the authorized individual having the authority to give instructions pertaining to the work and to approve or reject the work. The "Project Manager" shall not however be authorized to revoke, alter, enlarge, relax, or release any requirements of the Contract, Plans, and Specifications, nor shall they act as an agent for the Contractor. All Contract items pertaining to the Utility Owner shall be coordinated with the Georgia Department of Transportation's (GDOT) Project Manager and the Utility Owner.

670.1.02 Related References

A. Standard Specifications

Section 104—Scope of Work

Section 107—Legal Regulations and Responsibility to the Public

Section 108—Prosecution and Progress

Section 205—Roadway Excavation

Section 207—Excavation and Backfill for Minor Structures

Section 210—Grading Complete

Section 400—Hot Mix Asphaltic Concrete Construction

Section 444—Sawed Joints in Existing Pavements

Section 500—Concrete Structures

Section 600—Controlled Low Strength Flowable Fill

Section 611—Relaying, Reconstructing or Adjusting to Grade of Miscellaneous Roadway Structures

Section 615—Jacking or Boring Pipe

Section 810—Roadway Materials

B. Related Documents

1. General Provisions 101 through 150.
2. All products supplied and all work performed shall be in accordance with The Facility Owner's Standard Specifications, applicable standards from American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), GDOT Utility Accommodation Policy and Standards, and the Georgia Environmental Protection Division (EPD) Minimum Standards for Public Water Systems. Latest revisions of all standards shall apply.

670.1.03 Submittals

A. General Provisions 101 through 150.

B. Refer to The Facility Owner's Standard Specifications, current published edition, for water utility submittal requirements. Copies of all submittals and documentation shall be submitted to GDOT, who shall distribute to the Utility Owner.

C. Shop Drawings / Product Data

1. Submit [6] copies of the following submittals to the GDOT Project Manager:
   a. Product data, including size, dimension, capacity, pressure rating, accessories, and special features, installation instructions, and operating characteristics for all proposed materials to show compliance with the requirements of this Special Provision.
   b. Test reports specified in the Quality Acceptance section of this Special Provision.
   c. Pipe manufacturer certification of compliance with specifications.
   d. Operation and maintenance literature, warranties, and other specified information.

D. Construction Record Documentation

1. The Contractor shall record on two sets of utility as-built drawings that will record changes and deviations from the Contract Drawings in sizes, lines or grade. Record also the exact final horizontal and vertical locations of underground utilities and appurtenances to an accuracy of +/- 0.2 ft, referenced to permanent surface improvements. Drawings shall utilize State Plane Coordinates and shall be legibly marked to record actual construction and submitted to GDOT no later than 30 days after installation and prior to Final Acceptance of the Project. The Utility Owner shall determine if the utility record drawings are complete prior to Final Acceptance of the project.
2. Record Drawings shall be signed and sealed by a professional engineer or land surveyor registered in the State of Georgia.
3. Record Drawings shall also be submitted in digital format as indicated in accordance with the Department's current Electronic Utility File Guidelines.
4. Except for standard bound materials, bind all 8.5"x11" (A4) documentation, including 11" x 17" (A3) drawings folded to 8.5"x11" (A4), in logical groupings in loose-leaf binders of either the 3-ring or plastic slide-ring type. Permanently and appropriately label each such bound grouping of documentation.

670.1.04 Quality Assurance

A. The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project.

B. Furnish manufactured items, pipe, fittings, valves, service components, and appurtenances from manufacturers having regularly produced such items as specified herein which have proven satisfactory in actual service, over at least a 2-year period, or as approved by the Utility Owner and GDOT.

C. Regardless of tolerances permitted by industry standards specified herein, the Utility Owner or the GDOT Project Manager may reject pipe or appurtenances at the manufacturing plant or project site which have cracks, chips, blisters, rough interior or exterior surface, evidence of structural weakness, joint defects, or other imperfections that might in the opinion of the Project Manager contribute to reduced functional capability, accelerated deterioration or reduced structural strength.

D. The Utility Owner and the Utility Owner's consultant shall have the right to visit and inspect the work at any time. The Utility Owner may also have an Inspector assigned to the project authorized to inspect portions or all of the utility work done and the preparation, fabrication, or manufacture of the materials to be used. The Utility Owner shall be able to advise GDOT Project Manager of any observed discrepancies or potential problems. The cost of these inspections shall be the responsibility of the Utility Owner.

E. GDOT shall notify the Utility Owner before authorizing any changes or deviations which might affect the Utility Owner's facilities. Contractor shall notify GDOT and Utility Owner a minimum of 24 hours prior to beginning work on utilities.

F. The Utility Owner shall be notified by GDOT Project Manager when all utility work is complete and ready for final inspection. The Utility Owner shall be invited to attend the final inspection and may provide a corrections list to GDOT Project Manager prior to the final inspection.

G. The Contractor shall verify the actual location and depth of all utilities prior to construction. All utilities and structures shall be protected during construction. Any damaged facilities shall be repaired or replaced at the Contractor's expense.

670.2 Materials

All materials provided shall be in conformance with the requirements and standards set forth in The Facility Owner's Standard Specifications, current published edition. All pipeline and appurtenance materials in contact with potable water shall be National Sanitation Foundation (NSF) 61 Certified and part of GDOT QPL list.

Pipes and appurtenances shall comply with Section 1417(a)(1) of the Safe Water Drinking Act as amended in 2011 which prohibits the use of any pipe, any pipe or plumbing fitting or fixture, and solder, or any flux, after June 1986, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free as defined in Section 1417(d).

670.2.01 Water Piping systems and Appurtenances

A. Ductile Iron Pipe and Fittings

1. Ductile iron pipe shall meet the latest edition of ANSI/AWWA C150/A21.50 and C151/A21.51 for the class and joint specified with a nominal laying length of 18 (5.5 m) to 20 feet (6 m). Joints for buried ductile iron pipe shall be mechanical or push-on joints. Unless specified otherwise in The Facility Owner's Standard Specifications, ductile iron pipe diameters 12 inch (300 mm) or less shall be minimum Pressure Class 350, while pipe diameters greater than 12 inch (300 mm) shall be minimum Pressure Class 250.
2. Ductile iron pipe for the interior of structures and above ground installations shall be flanged. Flanges shall be ductile iron and shall be threaded-on flanges conforming to ANSI/AWWA C115/A21.15 or cast-on flanges conforming to ANSI/AWWA C110/A21.10. The minimum class thickness for ductile iron flanged pipe to be threaded is Class 53.
3. Interior surfaces of ductile iron pipe and fittings shall be cement mortar lined in accordance with AWWA C104.

4. Ductile iron shall have an exterior coating as specified in AWWA C151 for ductile iron pipe and AWWA C153/C110 for ductile iron fittings.
5. Buried ductile iron pipe and fittings shall be polyethylene encased at locations indicated on the Plans or as conditions warrant. Polyethylene encasement tubing shall be in accordance with ANSI/AWWA C105/A21.5 and ASTM A674 and shall have a minimum thickness of 8 mils. Polyethylene encasement tubing shall be blue in color to designate potable water.
6. Fittings: Ductile iron fittings shall be epoxy coated and meet the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110 A21.10 with a minimum pressure rating of 250 psi. Ends shall be restrained mechanical joint. All ductile iron fittings shall bear the NSF approval seal for potable water pipe.
7. Mechanical Joint Fittings: Mechanical joints consisting of bell, socket, gland, gasket, bolts, and nuts shall conform to ANSI/AWWA C111/A21.11.
8. Push-On Joints: Push-on joints shall be designed in accordance with ANSI/AWWA C111/A21.11. Joint lubrication shall be as furnished by the manufacturer.
9. Rubber gasket joints for push-on or mechanical joints shall conform to the requirements of ANSI/AWWA C111/A21.11.
10. Restrained Joints: Restrained joints shall be provided as shown on the Plans and where required for thrust restraint. Restrained joints shall not require field welding or grooves cut into the pipe barrel for restraint. The restraining joints for mechanical joint fittings shall conform to the requirements of ANSI/AWWA C111/A21.11 with assembly in conformance with AWWA C600 and manufacturer's recommendations. Restrained joints for pipe shall be mechanical joints with ductile iron retainer or push-on type joints and shall have a minimum rated working pressure of 250 psi.
11. Mechanical joint retainer glands may be used to restrain mechanical joint pipe and fittings to the plain end of ductile iron pipe and fittings. Restrainer glands shall be manufactured of ductile iron per ASTM A536.
12. Corrosion-resistant bolts used with ductile iron joints shall be high-strength, low-alloy steel as specified in ANSI/AWWA C111/A21.11.
13. Welded Outlets: Welded outlets in ductile iron pipe shall be provided where specified and indicated on the Plans. Outlets shall be fabricated by welding sections of ductile iron pipe manufactured in accordance with ANSI/AWWA C151/A21.51. Welded outlet pipe shall be fabricated only by the pipe manufacturer. The minimum ductile iron pipe thickness for fabrication of welded outlet pipe shall be Thickness Class 53 for 4-inch to 54-inch (100 to 1350 mm) diameter pipe. All joints on welded-on branch outlets shall be provided in accordance with the latest revision of ANSI/AWWA C111/A21.11 and/or ANSI/AWWA C115/A21.15, as applicable. After the outlets are welded together and prior to finishing, the assembly shall be subjected to a 15 psi air test for leakage. The maximum size and laying length of the welded-on branch outlet shall be recommended by the pipe manufacturer and acceptable to the Utility Owner for the field conditions and connecting pipe or valve.

B. Polyvinyl Chloride (PVC) Pipe

1. PVC pipe diameters 4-inch through 12-inch (100 mm to 300 mm) shall meet ANSI/AWWA C900 requirements, and shall be a minimum pipe dimension ratio (DR) 18, Pressure Class 235 psi. PVC pipe diameters 14-inch (350 mm) and greater shall meet ANSI/AWWA C905 requirements, shall be DR 18 minimum, Pressure Class 235 psi. Pipe shall have a bell with an integral wall section with a factory installed, solid cross section elastomeric ring in accordance with ASTM F477.
2. All PVC pipe shall be formulated for sunlight exposure, be blue in color to designate potable water, and bear the NSF approval seal.
3. Joints for 4-inch (100 mm) and larger PVC pipe shall meet the requirements of AWWA C900/C905, latest edition. The rubber gaskets used for the joints shall consist of flexible elastomeric material conforming to ASTM F477.

4. PVC pipe shall have the same outside diameter (OD) as ductile iron pipe and be compatible for use with ductile iron fittings.
5. Fittings for PVC pipe 4 inches (100 mm) and larger shall be ductile iron mechanical joint and comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.
6. Restrained Joints: Restrained joints shall be provided as shown on the Plans and where required for thrust restraint. Restrained joints shall comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.
7. Unless specified otherwise in the Plans or The Facility Owner's Standard Specifications, 2-inch (50 mm) and 3-inch (75 mm) diameter PVC pipe shall conform to the requirements of ASTM D2241 Class 1120 or 1220 (SDR 21) with a working pressure rating of 200 psi with integral bell gasketed joints. Pipe is to be manufactured to IPS standard pipe equivalent outside diameters.
8. Schedule 80 PVC pipes smaller than 4-inch (100 mm) nominal diameter shall be in accordance with ASTM D1785. Schedule 80 pipe shall have threaded joints. Solvent cemented joints are not allowed for buried pipes. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All threaded joints shall be watertight.
9. Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively.

C. Fusible PVC Pipe

1. Fusible PVC pipe sizes 4-inch (100 mm) to 36-inch (900 mm) shall conform to AWWA C900/C905 as applicable and follow the dimension ratios (DR) set forth in the requirements listed for PVC pipe.
2. Fusible PVC pipe shall be blue in color to designate potable water.
3. Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
4. Fusible PVC pipe shall be manufactured in a standard 40-foot nominal length-, or custom lengths as specified.
5. Joints shall be made by butt fusing sections of pipe with manufacturer-approved equipment.
6. Fittings shall be ductile iron mechanical joint and comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.

D. High Density Polyethylene (HDPE) Pipe

1. HDPE pipe sizes 4-inch (100 mm) and larger shall be a PE 4710/3408 high density, extra-high molecular weight polyethylene manufactured from first-quality high density polyethylene resin containing no additives, fillers, or extenders. The HDPE pipe shall have an ASTM D3350 cell classification of PE 445574C , shall meet the requirements of AWWA C906, and shall be sized based upon the ductile iron pipe size (DIPS), outside diameter (OD) sizing system.. The HDPE pipe shall be a minimum DR 11, pressure class 160 psi, and shall bear the NSF approval seal.
2. HDPE pipe shall be blue or marked with a permanent blue stripe to designate potable water.
3. Joints shall be made by butt fusing sections of pipe with manufacturer-approved equipment.
4. Fittings shall be ductile iron mechanical joint meeting the requirements of ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11.
5. The pipe shall have fusion welded restrainer ring, follower gland, and a 12-inch (300 mm) stainless steel insert for the mechanical joint connection.
6. HDPE water mains shall be properly sized utilizing the inside diameter of the nominal pipe diameter. If during construction HDPE is substituted for other pipe materials, the Contractor shall verify that the inside diameter of the HDPE is the same or larger than the inside diameter of the pipe originally specified.

E. Steel Casing Pipe

1. All materials, design, fabrication, handling, and testing of steel casing pipe shall conform to the requirements of ASTM A139, AWWA C200 and AWWA Manual M11 "Steel Pipe – A Guide for Design and Installation."
2. Steel casing pipe shall be new, smooth-wall, carbon steel pipe conforming to ASTM Specification A139, Grade B with a minimum yield strength of 35,000 psi. Steel casings shall be used with the size, minimum thickness, length, and coating specified on the Plans or The Facility Owner's Standard Specifications.
3. Additional anti-corrosion measures, as specified by the manufacturer or indicated on the Plans, shall be provided at connectors, couplings, rollers, restraints, etc.
4. Unless specified otherwise in the Plans or The Facility Owner's Standard Specifications, casing pipe end seals shall consist of ⅛-inch (6 mm) thick flexible synthetic rubber boot with adjustable stainless steel banding straps. The annular space of the casing shall not be filled with concrete or grout.
5. Casing spacers shall consist of a stainless steel shell, PVC ribbed liner, and non-conducting separators to keep the carrier pipe from touching the casing pipe. Spacers shall be provided at a maximum of 10-foot intervals and within 2 feet (0.6 m) of the end of the casing pipe.

F. Pipe Detection Wire

1. Unless otherwise specified by the Plans or The Facility Owner's Standard Specifications, open cut installations of non-metallic pipe shall include minimum #12 gauge tracing wire. Pipe installed by directional drill shall include two (2) insulated 8 gauge tracer wire. Wire shall be solid copper insulated with HDPE installed along pipe, wrapped around service line stub outs and stubbed into valve boxes for locating purposes. Wire shall be properly spliced to provide continuous conductivity.

G. Warning Tape

1. Water mains shall be installed with polyethylene film warning tape manufactured for marking and identifying underground water utilities. Tape shall be a minimum of 2 inches (50 mm) wide and 4 mils thick, blue in color, with continuously printed letters reading "CAUTION BURIED WATER LINE BELOW".

H. Gate Valves

1. Gate valves 3 inches (80 mm) and larger shall be of the resilient seat type meeting the requirements of AWWA C509 or C515. Valves shall be iron body, bronze trimmed, with non-rising stems, and shall be fusion-bonded epoxy coated per ANSI/AWWA C550. Valves shall have a minimum design working pressure of 200 psi.
2. Valves shall be manually operated by nut and open counter-clockwise unless specified otherwise in the Plans or The Facility Owner's Standard Specifications.
3. The resilient seating arrangement shall provide zero leakage at the design working pressure when installed with line flow in either direction. All ferrous surfaces inside and outside shall have a fusion bonded epoxy coating. All valves shall be provided with O-ring seals. The design and machining of valves shall be such as to permit replacing the O-ring seals in the valves while in service without leakage.
4. All gate valves, when fully opened, shall have an unobstructed waterway diameter equal to or larger than the full nominal diameter of the valve.
5. In general, valves shall be designed for vertical installation. Valves installed in the horizontal position shall be provided with bevel gears, extended gear case, rollers, tracks, and scrapers.
6. Exposed or above-ground gate valves shall be outside screw and yoke (OS&Y) flanged joint type with an operating hand wheel. The face-to-face dimensions and drilling shall conform to ANSI B16.10 for Class 125 flanged joint end gate valves.
7. Valves shall include mechanical joints, bolts, glands, gaskets, and all other materials necessary to join to existing work.

8. Provide brass identification tag imprinted with "WATER", valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch (6 mm) thick brass with a ¼-inch (8 mm) hole.

I. Insertion Valve

1. Insertion type valves shall be resilient wedge gate valves designed to be installed into an existing pressurized potable water main without interruption of flow through the pipe and no reduction of line pressure.
   a. Valve shall be fusion-bonded epoxy coated in compliance with AWWA C550.
   b. The construction of the resilient wedge shall comply with AWWA C509 requirements.
   c. The resilient wedge shall be fully encapsulated with EPDM rubber and shall seat on the valve body and not the pipe. The resilient wedge shall be totally independent of the carrier pipe.
   d. Valve shall be restrained to the pipe.
   e. Valves shall be suitable for operating pressures up to 250 psi.

J. Butterfly Valves

1. Butterfly valves shall be of the tight-closing, rubber seated type, with rubber seat positively locking in place sealing against flow from either direction. Valves shall be hand operated with cast or ductile iron bodies. Valves shall conform to the requirements of AWWA C504, Class 150B, and shall be fusion-bonded epoxy coated per ANSI/AWWA C550.
2. Valves shall have a 2-inch (50 mm) square operating nut and shall be installed with extension stems to extend the operating nut in accordance with the project details. Valves shall open by turning the operating nut counter clockwise unless specified otherwise in the Plans or The Facility Owner's Standard Specifications.
3. Valve shafts shall be of 304 or 316 stainless steel.
4. Buried butterfly valve end connections shall be installed using restrained mechanical joints.
5. Flanged valves shall be fully faced and drilled in accordance with ANSI Standard B16.1, Class 125.
6. Provide brass identification tag imprinted with "WATER", valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch (6 mm) thick brass with a ¼-inch (8 mm) hole.

K. Ball Valves

1. Ball valves 2-inch (50 mm) and smaller shall be designed for a working pressure of not less than 175 psi. End connection shall be threaded. The body and all parts shall be made in accordance with AWWA C800 and ASTM B62 latest revision.

L. Tapping Sleeves and Valve Assembly

1. Tapping sleeves and valves sizes 4-inches (100 mm) and larger shall be stainless steel with wraparound gasket style, or ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be rated for a minimum 150 psi working pressure in accordance with ANSI/AWWA C110/A21.10.
2. When tapping an existing asbestos cement pipe, a stainless steel tapping sleeve which contains a full gasketed surface within the sleeve body shall be used due to variances in the manufactured outside diameter of the asbestos cement pipe.
3. Tapping sleeve shall have an outlet flange per ANSI B16.1, Class 125 standard.
4. The Contractor shall determine the outside diameter of the existing main before ordering the sleeve.
5. Tapping valves shall be mechanical joint outlet, non-rising stem, resilient seated gate valves meeting the applicable requirements of ANSI/AWWA C509/C515 and C550 with a minimum design working pressure of 200 psi.
6. Tapping valves shall be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made.
7. Tapping valves shall be manufactured with an integral tapping flange having a raised lip design.

8. Tapping valves shall be furnished with a combination flange and mechanical joint for connecting the branch to the main.

M. Valve Boxes

1. All valves shall be equipped with valve boxes. The valve boxes shall be heavy, roadway type boxes. The valve box cover shall be marked "WATER VALVE" or "WATER".
2. Valve box materials shall conform to the requirements and standards set forth in the The Facility Owner's Standard Specifications, current published edition.
3. The valve boxes shall be adjustable up or down from the nominal required cover over the pipe. Extensions shall be provided as necessary. A precast concrete ring shall be placed around the valve box opening when outside of paved areas.
4. Valves shall be furnished with extension stems as necessary to bring the operating nut to within 24 inches (600 mm) minimum of the top of the valve box.

N. Service Connection Assemblies

1. Water service connections and plumbing should conform to the standards set forth in The Facility Owner's Standard Specifications and relevant local and/or state plumbing codes or to the Standard Plumbing Code as applicable within the jurisdiction in which the system is located.
2. Service connection assemblies shall be provided for all new service line connections to existing meters. Existing service lines indicated for replacement shall be replaced with new materials from the water main to the existing or new water meter.
3. Service connection assemblies shall include:
    a. Service saddle
    b. Corporation stop
    c. Service line
    d. Fittings
    e. Curb stop
    f. Water meter box
    g. Water meter (separate Pay Item for new service connections)
    h. Backflow preventer (separate Pay Item for new service connections)

O. Service Saddles

1. Service saddles shall have ductile iron or bronze body with stainless steel epoxy coated double tie straps and nuts with pressure rating not less than that of the pipe to which it is to be connected.
2. Saddles shall have a rubber gasket cemented to the body, with compatible threading between the saddle and corporation stop. Saddles shall conform to ANSI/AWWA C800 standards.
3. The service saddle shall provide full support around the circumference of the pipe, providing a bearing area of sufficient width so that pipe will not distort when the saddle is tightened.

P. Water Service Pipe

1. Polyethylene (PE) pipe for water service lines shall conform to AWWA C901 and ASTM D-2737 and shall be 200 psi pipe, SDR 9 for copper tube size (CTS). Polyethylene extrusion compound from which the polyethylene pipe is extruded shall comply with applicable requirements for PE 3408 ultra-high molecular weight polyethylene plastic material as specified in AWWA C901.
2. Marking on the PE service pipe shall include the nominal pipe or tubing size, the type of plastic material, the standard thermoplastic pipe dimension ratio or the pressure rating in psi, the ASTM designation with which the pipe complies, and manufacturer's name or trade mark and code. It shall also include the NSF seal of approval for use with potable water.

3. Copper tubing for water service lines shall be seamless and shall conform to ANSI/AWWA C800 and ASTM B88, Type K soft, suitable for potable water use with a working pressure of 150 psi.
4. Water service line fittings shall be as indicated in The Facility Owner's Standard Specifications.

Q. Corporation and Curb Stops

1. Corporation stops, curb stops, and other appurtenances for plastic or copper service lines shall meet the requirements of ASTM B62 and AWWA C800.
2. Service line taps shall be equipped with corporation stops. Corporation stops in sizes 1-inch (25 mm) through 2-inch (50 mm) shall be manufactured from cast bronze with machined fitting surfaces. The corporation shall be pressure rated to no less than 150 psi.
3. Curb stops shall be ball valve type and made of bronze. Pipe connections shall be suitable for the type of service pipe used and shall be pressure rated for no less than 150 psi.

R. Water Meters

1. Water meters shall conform to the requirements and standards set forth in The Facility Owner's Standard Specifications.

S. Meter Boxes

1. Water meter boxes shall be high density reinforced plastic body with one piece cast iron lid with lettering "WATER METER" on cover unless otherwise indicated on the Plans. Recessed hole shall be included in lid, if required by Utility Owner for electronic reading capability. Provide box of size and height appropriate to installation of meter and accessories required. Meter and curb stop shall be fully encased by the meter box.

T. Concrete Vault

1. Concrete vaults shall conform to the requirements and standards set forth in The Facility Owner's Standard Specifications and standard details.

U. Air Release Valve Assembly

1. Air release, air/vacuum valves, and combination air valves shall be suitable for use with potable water systems and manufactured in compliance with ANSI/AWWA C512.
2. Air release valves shall have a small venting orifice to vent the accumulation of air and other gases in the line or system under pressure.
3. Air/vacuum valves shall have a large venting orifice to permit the release of air as the line is filling or relieve the vacuum as the line is draining or is under negative pressure.
4. Combination air valves shall have operating features of both the air/vacuum valve and air release valve.
5. Valves shall be suitable for pressures up to 250 psi.
6. Air release, air/vacuum valves, and combination air valves shall conform to the requirements set forth in The Facility Owner's Standard Specifications and standard details.

V. Fire Hydrant Assembly

1. Fire hydrants shall be the compressive, post style, dry barrel type, and shall conform to the requirements of ANSI/AWWA C502 and local code requirements. The valve opening shall not be less than 4½-inch (115 mm). All hydrants shall be complete including joint assemblies.
2. Hydrants shall be suitable for working pressure of 150 psi and shall be hydrostatically factory tested to 300 psi.
3. All working parts, including the seat ring, shall be removable through the top without excavating or disturbing the barrel of the hydrant.
4. Hydrants shall be constructed with a lubricant chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be

comprised of a top O-ring serving as a dirt and moisture barrier and a lower O-ring which will serve as a pressure seal.

5. Hydrants shall include two 2½-inch (65 mm) hose nozzles and one 4½-inch (115 mm) pumper connection with National Standard Fire Hose Threads unless specified otherwise in the Plans or The Facility Owner's Standard Specifications. Hydrant threads shall comply with the specifications of the local agency providing fire service.
6. Hydrant nozzle shall be constructed to face in any direction at any time by removing the safety flange bolts and revolving the head without digging or shutting off water.
7. Hydrants shall have pentagon operating nut measuring 1½-inch (40 mm) point to flat and shall open by turning counter-clockwise.
8. Hydrant shall have a safety-type vertical barrel with a minimum 3½-foot bury and be designed with safety flange and/or bolts to protect the barrel and stem from damage, eliminate flooding, and allow rapid replacement if hydrant is struck. All risers necessary for deeper bury applications shall be provided by the hydrant manufacturer.
9. Hydrants shall include positive, automatic drain valves which shall be fully closed when the main valve is open.
10. Bottom inlet of hydrant shall be provided with mechanical joint connection complete with accessories as specified and shall be 6-inch (150 mm) nominal diameter.
11. Fire hydrant shall be painted above ground with rust inhibiting enamel paint in accordance with The Facility Owners Standard Specifications.
12. Hydrant assemblies shall be restrained from the hydrant to the tee at the main.

W. Backflow Prevention Devices

1. Backflow prevention devices shall be installed where indicated on the Plans and shall meet all applicable AWWA, State, and local code/ordinance requirements.
2. Backflow preventer materials shall conform to the requirements and standards set forth in The Facility Owner's Standard Specifications.

X. Thrust Collars and Thrust Blocks

1. Concrete used for thrust collars or thrust blocks shall meet the "Class A" requirements for concrete listed in Section 500.
2. Thrust collars shall include welded-on collars attached by the pipe manufacturer or retainer glands. Concrete shall be poured continuous around the pipe and bear against undisturbed earth.
3. Reinforcing steel shall meet the requirements set forth in the Plans or The Facility Owner's Standard Specification].
4. Mechanical joint restraints shall be utilized in lieu of thrust blocks with the approval of Utility Owner.

Y. Manholes

1. Precast reinforced manholes shall be manufactured in accordance with ASTM C478 and shall have a minimum wall thickness of 5 inches (127 mm). All concrete shall have a minimum compressive strength of 4,000 psi when tested in accordance with ASTM C478.
2. Joints between precast sections shall be sealed by means of rubber O-ring gaskets or flexible butyl rubber sealant.
3. Non-shrinking grout or a flexible seal shall be used to seal the pipe penetrations and prevent water from entering the manhole.
4. Manhole rings and cover shall be per The Facility Owner's Standard Specifications and standard details.

670.2.02 Delivery, Storage, and Handling

A. Handle pipe, fittings, valves, and accessories carefully to prevent damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings, or appurtenances.

B. To unload pipe, carefully lift and lower it into position using approved padded slings, hooks, or clamps. Furnish equipment and facilities for unloading, handling, distributing, and storing pipe, fittings, valves, and accessories. Make equipment available at all times for use in unloading. Do not roll, drop or dump materials. Any materials dropped or dumped shall be subject to rejection without additional justification.

C. Stored materials including salvaged materials shall be kept in suitable areas safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Store and support plastic pipe to prevent sagging and bending. Store plastic pipe and gaskets to prevent exposure to direct sunlight. Valves and hydrants shall be stored and protected from damage by freezing.

D. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete.

670.3 Construction Requirements

670.3.01 Personnel

A. General Provisions 101 through 150.

B. Construction and installation of all water utilities shall be performed by a Contractor prequalified/registered with GDOT.

C. All work specified in this section, except for water system service line installation shall be performed by a Contractor with a valid Utility Contractor's license issued by the State of Georgia. Water service line installation shall be performed by either a Utility Contractor licensed in the State of Georgia or by a Master Plumber licensed in the State of Georgia.

670.3.02 Equipment

A. Ensure all equipment used is in conformance with the requirements and standards set forth in The Facility Owner's Standard Specifications, current published edition.

670.3.03 Preparation

General Provisions 101 through 150.

670.3.04 Fabrication

General Provisions 101 through 150.

670.3.05 Construction

A. Finding Existing Underground Utilities and Obstructions

1. Comply with Subsection 107.13 and Subsection 107.21.
2. According to the best information available to GDOT, all known water lines, sewer lines, gas lines, telephone conduits, drainage structures, etc. are shown on the Plans. However, to find such installations, use an electronic pipe and cable finder in locating existing installations or obstructions to the work.
3. When unforeseen conflicts require Plan changes, perform the work as altered according to Subsection 104.03 and Subsection 104.04.
4. Follow all Utility Owner customer notification requirements and obtain approval from the Utility Owner and GDOT Project Manager prior to disrupting any existing water services as required to install the water facilities shown on the Plans.

B. Jack and Bore

Comply with Section 615 for water main installations by jack and bore.

C. Directional Drilling

1. Install water mains and services by means of directional drilling at locations shown on the Plans or where approved by GDOT or Utility Owner. Provide submittals and follow all relevant procedures and requirements set forth in The Facility Owner's Standard Specifications.
2. The Contractor shall not initiate horizontal directional drilling until all submittals are received, reviewed, and accepted by GDOT and the Utility Owner, and all required permits are obtained.

3. The Contractor shall select drilling additives and fluid mixture proportions to ensure continuous circulation, bore stability, reduce drag on the pipe, and completely fill the annular space between the bore and the pipe to ensure stability and control settlement.
4. The Contractor shall submit contingency plans for remediation of potential problems that may be encountered during the drilling operations. The contingency plans shall address the observations that would lead to the discovery of the problem and the methods that would be used to mitigate the problem. Potential problems that shall be addressed include:
    a. Loss of returns/loss of circulation of drilling fluid.
    b. Encountering obstruction during pilot bore or reaming/pullback.
    c. Drill pipe or product pipe cannot be advanced.
    d. Deviations from design line and grade exceed allowable tolerances.
    e. Drill pipe or product pipe broken off in borehole.
    f. Product pipe collapse or excessive deformation occurs
    g. Utility strike.
    h. Hydrolock occurs or is suspected.
    i. Excessive ground settlement or heave of ground surface or existing utilities.
    j. Inadvertent returns / hydrofracture or surface spills resulting in drilling fluids entering water or reaching the surface.
5. Pipe damaged in directional drilling operations shall be removed and replaced at no additional expense to GDOT or the Utility Owner.
6. Voids developed or encountered during the installation operation shall be pressure grouted with a grout mix approved by GDOT.
7. Installation shall include a locatable conduit system, with identification markers on each side of GDOT right-of-way where applicable. Two (2) insulated 8 gauge solid copper tracers wire shall be attached to the leading end of the pipe pulling head and shall extend the full length of the installed pipe.
8. The location and alignment of the pilot drill progress shall be continuously monitored for compliance with the proposed installation alignment and for verification of the depth of the bore. Monitoring shall be accomplished by computer generated bore logs which map the bore path based on x, y, z coordinate information provided by the locating/tracking system. Readings or plots shall be obtained on every drill rod, and shall be provided to the Inspector on a daily basis. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed tolerances specified elsewhere, such occurrences shall be reported immediately to GDOT. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.
9. Upon completion of the directional drill the Contractor shall furnish GDOT and the Utility Owner an as-built drawing along with a report of the monitoring of the drilling fluids during the pilot hole and back reamed hole.
10. Drilling fluid pressures, flow rates, viscosity, and density shall be monitored and recorded by the Contractor. The pressures shall be monitored at the pump. These measurements shall be included in daily logs submitted to GDOT. The Contractor shall document modifications to the drilling fluids, by noting the types and quantities of drilling fluid additives and the dates and times when introduced. The reason for the addition of drilling fluid additives or other modifications shall be documented and reported.
11. Management and disposal of drilling fluids shall be the Contractor’s responsibility. Excess drilling fluids shall be contained at the entry and exit points until recycled or removed from the site. All drilling fluids shall be disposed of in a manner acceptable to the appropriate local, state and federal regulations. The Contractor’s work will be immediately suspended by GDOT whenever drilling fluids seep to the surface other than in the boring entrance or exit pit, or when a paved surface is displaced.

12. Surfaces damaged by the work shall be restored to their preconstruction conditions at no additional cost to GDOT or Utility Owner, and with no increase in contract time.
13. The following items shall be as shown on the Plans, unless otherwise approved in writing by GDOT:
    a. Entry / exit points
    b. Drill entry / exit angles
    c. Pilot bore path
        1) Radius of Curvature
        2) Entry / exit tolerances: Contractor shall be solely responsible for all work necessary to correct excessive deviations from line and grade, including re-drilling, redesigning connections, and acquiring additional easement, at no additional cost to GDOT or Utility Owner and without schedule extension.
14. The pilot bore shall be pre-reamed and reamed using equipment and methods submitted by the Contractor. The Contractor shall completely ream the bore to the final diameter prior to pullback.
15. Pullback: The pipe shall be installed by pulling it into the reamed bore path in a continuous operation, behind a final reaming tool selected by the Contractor. The pipe shall be isolated from excessive torsional and axial stresses by a swivel device with a pre-established breakaway tensile capacity that is lower than the allowable tensile strength of the pipe. The maximum pull (axial tension force) exerted on the pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer with an appropriate factor of safety so that the pipe or joints are not overstressed. The end of the pipe shall be closed during the pull back operation.
16. Pipelines shall be adequately supported during installation so as to prevent overstressing or buckling. The Contractor shall provide adequate support/rollers along the pipe layout area to support the required length of pipe for the bore. The pipe layout area shall be cleared of all large stones, construction debris, or other foreign objects that could damage the pipe during pullback. The Contractor shall monitor and inspect pipe rollers and method for suspending pipe at entry during the pullback operation to avoid damage to the pipe.
17. The end of the pipe shall be closed during the pull back operation.
18. Each length of pipe shall be inspected and cleaned as necessary to be free of debris immediately before joining.
19. The Contractor shall at all times handle the pipe in a manner that does not overstress or otherwise damage the pipe. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense. The Contractor shall take appropriate steps during pullback to ensure that the pipe and tracer wires will be installed without damage.
20. If necessary, the pipe shall have water added as it enters the bore to achieve neutral buoyancy and reduce pullback loads and to ensure that adequate internal pressure is maintained at all points to counter balance collapse pressures.
21. The Contractor shall cease pullback operations if the pipe is damaged and shall remove the pipe from the bore and repair the pipe using the manufacturer's recommended procedure or replace the damaged pipe before resuming installation.
22. Damage to the pipe resulting from manufacturer defects, installation, or grouting is the responsibility of the Contractor, including costs for replacement and labor and materials. To confirm no damage to the pipe, upon completion of pull back, the Contractor shall pull a sphere or pig through the entire length of the pipeline. The pig shall be one inch less in diameter than the internal diameter of the product pipe, capable of allowing water to pass through it, complete with a pulling cable on either side. If the pig or sphere cannot pass through the pipe, it shall be considered collapsed and damaged.
23. After the carrier pipe is completely pulled through the bore, a sufficient relaxation period as recommended by the pipe manufacturer shall be provided before the final pipe tie-in.
24. The Contractor shall conduct a final hydrostatic test of the installed pipeline. Final test shall be in accordance with these specifications. The Contractor shall repair any defects discovered during this test, and repeat until the pipe passes the test.

D. Excavating Trenches

1. The Contractor shall provide all necessary shoring and bracing materials as required to assure safe working conditions and to protect the excavations. The Contractor shall be required to fully comply with all applicable OSHA Excavation Safety Standards. No separate payment shall be made for any special procedure used in connection with the excavation.
2. Excavate trenches to the proper depth and width as follows:
   a. Trench to Grade: Excavated trench bottoms shall be firm, free from boulders, and conform to the established grade. Limit open trench excavation to a maximum of three 300 feet (90 m) ahead of completed backfill.
   b. Care shall be taken not to over excavate except where necessary to remove unstable material, irregularities, lumps, rock, and projections. Unnecessary over excavation shall be replaced at the Contractor's sole expense and in accordance with Subsection 670.3.05.
   c. Excavation carried below the established grade lines shown or established by the Utility Owner shall be backfilled according to Section 207 and Subsection 670.3.05. Use Class I or Class II Soils (defined in Section 810) and firmly compact the soil.
   d. Where the established grade of a trench is in rock, undercut the bottom of the trench by at least 6 inches (150 mm) beneath the pipe or conduit and the greater of 24 inches (600 mm) wider than the pipe/conduit (12 inches or 300 mm each side) or 42 inches (1050 mm) wide, then backfill and compact according to Subsection 670.3.05.
   e. Excavation in pavement and pavement patching shall be according to GA Standard No. 1401. Remove the pavement according to Section 444, except no separate payment shall be made for sawed joints.
   f. Dewatering: Remove all water from excavations and maintain the excavations free of water while construction therein is in progress. Provide dewatering equipment as necessary to conform to this requirement. Dewatering procedures must meet all state and local regulatory requirements.
3. Minimum Trench Depth
   a. Excavate trenches to provide at least 48 inches (1.2 m) cover depth directly above the pipe to the finished pavement surface, sidewalk, grass, etc. unless indicated otherwise on the Plans or by the Utility Owner and GDOT Project Manager. In order to avoid existing utilities, it may be necessary for the pipe to be laid shallower or deeper than the minimum cover specified. At such time the Contractor shall not be allowed extra compensation for additional excavation necessary for deeper installations.
   b. Side slopes of the trenches shall be as nearly vertical as practicable. Trenches in excess of 5 feet (1.5 m) deep shall either have the trench sides laid back to conform to OSHA requirements for trench safety, if such area is available within the limits of excavation, or, alternatively, trenches deeper than 5 feet (1.5 m) shall be excavated via trench box or shored and braced.
   c. If any part of a water main is to be placed in or under a new embankment, finish the embankment to at least a 2-foot plane above the outermost portion of the pipe barrel before excavating the trench.
4. Trench Width: Excavate trenches to uniform widths wide enough to allow proper installation of pipe, fittings, and other materials, a minimum of 6 inches (150 mm) and a maximum of 12 inches (300 mm) each side of the pipe or conduit.
5. Trench Bell Holes: Excavate bell holes deeply and widely enough to make joints and to allow the pipe barrel to rest firmly on the trench bottom.
6. Trench bottom: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduits. Shape subgrade to provide continuous support of bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits/pipes. Remove projecting stones, tree roots, debris, and sharp objects along trench subgrade. Abrupt changes in grade of the trench bottom shall be avoided. Unless otherwise indicated in the Plans or The Facility Owner’s Standard Specifications, trenches for water mains shall be graded as much as possible to avoid high and low points that necessitate air release valves.

7. Excavations may be completed and refilled either by hand or by machinery. Hand tool excavation shall be conducted where necessary to protect existing utilities and structures.
8. In the event that unsuitable material is encountered at or below the excavation depth specified or shown on the Plans, the Utility Owner and GDOT Project Manager shall be notified. Such material shall be removed and replaced with suitable material in accordance with Section 205 by the written request of the GDOT Manager.

E. Connecting to Existing Mains

1. Connect to an existing main with the appropriate fittings according to the Plans or the Utility Owner and GDOT Project Manager. When making connections under pressure, (i.e. when normal water service must be maintained), furnish and use a tapping sleeve and valve assembly or line stop fittings as indicated. Coordinate with Utility Owner 72 hours in advance for water service interruptions and temporary shut-offs. Evening or weekend work may be required to complete direct connections and tie-ins. Connect to existing mains as follows:
   a. Before opening new pipeline trenches, locate the various points of connection to be made into existing pipelines. If necessary, uncover pipelines for the Utility Owner and GDOT Project Coordinators to prescribe the connections and fittings needed.
   b. Connect to existing pipelines only to meet operating requirements. Cut existing lines only after obtaining the Utility Owner and GDOT Project Manager' permission.
   c. Provide temporary line stops, associated fittings, and bypass pumping as indicated on the Plans and as necessary when cutting and plugging existing water mains to prevent service interruptions. Line stop and associated fittings shall be suitable for working pressures of 250 psi.
   d. Connections to existing asbestos cement pipe shall be installed as indicated on the Plans or in The Facility Owner's Standard Specifications. Cutting, removing, handling, and disposing of asbestos cement pipe shall be in accordance with requirements established by EPA, OSHA, GDOT, NIOSH, and the State of Georgia Environmental Protection Division, and any other applicable laws and ordinances.

F. Laying Water Mains and Appurtenances

1. Preparing and Handling Pipes
   a. Thoroughly clean the pipe and fittings before laying them. Keep them clean until accepted.
   b. Use suitable tools and equipment. Do not damage the pipe, especially the cement lining inside the pipe.
   c. Cut pipe in a manner to avoid damage to pipe or lining, leaving a smooth end at right angles to pipe axis. Smooth and bevel edges of cut pipe for push-on, gasket type joints.
   d. Bedding shall be provided as specified by the Utility Owner or pipe manufacturer for the type of conditions encountered. Bedding typically consists of granular soil free of lumps, clods, cobbles, and frozen materials, and shall be graded to a firm-but-yielding surface without abrupt changes in bearing value. Unstable soils and rock ledges shall be undercut from the bedding zone and replaced with suitable material.
   e. Bed pipe on coarse granular material in flat bottom trench with entire pipe barrel bearing uniformly on coarse granular material, except for an approximately 18-inch (450 mm) gap at pipe balance point for sling removal. Hand excavate and backfill as required to provide uniform and continuous bearing and support for the pipe. Do not support pipe on hubs or end bells. Consolidate coarse granular material under and around pipe up to pipe centerline by tamping.
   f. Join pipe with bells facing direction in which laying operation is progressing. Lay pipe upgrade wherever line grade exceeds 10%.
   g. Carefully examine pipe for cracks and other defects and do not lay defective pipe. If pipe or castings appear to be cracked, broken, or defective after laying, remove and replace those sections.
2. Alignment and Gradient

a. Pipe alignment and gradient shall conform to the Plans. Deflect pipe lines only where indicated on the Plans, within allowable horizontal and vertical deflection angles according to the manufacturer.

b. Water mains shall be laid at least 10 feet (3 m) horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge. When local conditions prevent a horizontal separation of 10 feet (3 m), the water main may, on a case-by-case basis, be laid closer to a sewer provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches (450 mm) above the top of the sewer.

c. Maintain a vertical separation of at least 18 inches (450 mm) between the crown of sanitary sewers and the invert of existing or proposed water mains with the sewer located below the water main. Where a vertical separation of 18 inches (450 mm) cannot be provided, and the water main cannot be relocated to provide adequate clearance, center one full length of water main over the sewer so that both joints of the water main will be as far from the sewer as possible.

3. Special Requirements for Laying Water Mains
   a. Excavate, clean, lay, joint, and backfill progressively and uniformly according to these requirements:
      1) Never leave pipe in the trench overnight without completely jointing and capping.
      2) Do not leave completed pipeline exposed in the trench. Backfill and compact the trench as soon as possible after laying, jointing, and testing are complete.
      3) At the close of work each day and when laying pipe, close the exposed end of the pipeline in the trench with an approved wood or metal head or barrier.
      4) If necessary to cover the end of an incomplete pipeline with backfill, close the end of the pipe with a satisfactory cap or plug.

G. Installing Water Mains by Open Cut

1. Use the following flexible joints for connections inside the roadway shoulders or curbs and gutters:
   a. Mechanical Joints:
      1) When using mechanical joints, thoroughly wash bell sockets, spigots, gland, gasket, nuts, and bolts with soapy water before assembly. Keep these parts wet until the jointing operation is complete.
      2) Tighten nuts within the torque range recommended by the manufacturer. Check the tightening tolerance with a torque wrench.
      3) If effective sealing is not attained at the maximum recommended torque, disassemble, thoroughly clean, then reassemble the joint.
      4) Do not overstress bolts to compensate for improper installation or defective parts.
   b. Push-On Type Joints
      1) Use push-on joints made according to the manufacturer's recommendations.
      2) Install PVC pipe in accordance with AWWA C605.
      3) Install ductile iron pipe in accordance with AWWA C600.
2. Restraints for pipe joints and fittings shall be provided as specified and as shown on the Plans. Restraints shall be installed per manufacturer's recommendations.
3. Buried ductile iron pipe and fittings shall be polyethylene encased as specified and as indicated on the Plans. Polyethylene encasement tubing shall be secured with polyethylene tape and installed in accordance with ANSI/AWWA C105/A21.5.
4. Unless otherwise specified by The Facility Owner's Standard Specifications, provide pipe detection wire on all non-metallic pipe systems. Tape the tracer wire to the top center of the pipe at intervals which prevent wire displacement during backfilling operations. Stub tracer wire up 6 inches (150 mm) above finished grade at all valves

and fire hydrants. For splices, use direct bury kits. After backfilling is complete, test electrical continuity of each tracer wire segment and provide test results to Utility Owner and GDOT Project Manager.

5. Install continuous underground warning tape during backfilling of trench for underground water distribution piping. Install 12 inches (300 mm) below finished grade, or 6 inches (150 mm) below subgrade under pavements and walkways, and buried directly over piping.
6. Use pipe cutters when cutting pipe or special castings. Do not use a hammer, chisel, or a cutting torch.
7. Locations where water mains do not meet minimum depth of cover requirements shall include a steel casing or concrete encasement installed per The Facility Owner's Standard Specifications.
8. If HDPE pipe is to be installed where high groundwater table or water surrounding the pipe is expected, precautions shall be taken to provide neutral buoyancy to prevent floatation or a change in alignment.
9. Isolation Valves on Water Mains: Install and joint gate and butterfly valves as specified in Subsection 670.2.01 in accordance with AWWA C600. Include the valve box and valve marker where required.
10. Air release valves shall be located at high elevation points on the pipeline. Air release valves shall be installed at locations indicated in the Plans and in accordance with manufacturer's recommendations.
    a. Air release valves shall be installed in a shallow manhole or vault as indicated in the Plans and The Facility Owner's Standard Specifications. Automatic air relief valves shall not be used in areas where flooding of the manhole or vault may occur.
    b. An isolation valve shall be installed between the air release assembly and the connection to the main.
    c. The Contractor shall furnish and install at no additional cost to GDOT or Utility Owner all necessary fittings for the installation of air release valves at high points.
11. Pressure reducing/sustaining valves of the size and type indicated shall be installed as shown on the Plans per manufacturer's recommendations and The Facility Owner's Standard Specifications.
12. Fire Hydrants: Install and joint hydrants as specified in Subsection 670.2.01 and in accordance with AWWA C600. Include required vertical extension sections. Also, include pipe strap installation, restraints, crushed stone drain, and backfill according to the Plans and this Section. Spacing of fire hydrants shall be as indicated in The Facility Owner's Standard Specifications.
13. Concrete Thrust Collars and Thrust Blocks: If required, furnish materials and install thrust collars or concrete blocking according to Subsection 670.2.01. Form and pour concrete thrust collars or blocks in accordance with the Plans and The Facility Owner's Standard Specifications. Blocking shall be poured against undisturbed earth and all forms shall be removed before backfilling.
14. Backfilling
    a. Furnish equipment, labor, and when necessary material required for backfilling the pipe line trenches according to Section 207, and as follows:
        1) When testing for visual leaks in open trenches, do not backfill until testing is complete and leaks are eliminated.
        2) When retaining pavement adjacent to trenches, replace removed pavement with the same or better material when approved in accordance with the appropriate Section for the pavement type replaced.
        3) Place backfill on subgrades free of mud, frost, snow, or ice.
        4) Place and compact bedding course on trench bottoms and where indicated. Shape the bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits/pipes.
        5) Backfill shall include Class I or Class II Soils as defined in Section 810 or suitable material that conforms with The Facility Owner's Standard Specifications.
        6) Backfill shall be placed in two stages: first, side fill to a height of 12 inches (300 mm) above the top of pipe; second, overfill to former surface grade. Side fill shall consist of granular material laid in 6-inch (150

mm) layers each consolidated by mechanical tamping and controlled addition of moisture, to a density of 95% as determined by as determined by the Standard Proctor test (AASHTO T-99 Method D) or GDT 67. Overfill shall be layered and consolidated to match the entrenched material in cohesion and compaction. The top 12 inches (300 mm) shall be compacted to 100% of specified density. Consolidation by saturation or ponding shall not be permitted.

7) Soil Moisture Control: Uniformly moisten and aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

8) Initial backfill shall be carefully compacted under pipe haunches and evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Place and compact fill and backfill of satisfactory soil to final subgrade elevation. Backfill voids with satisfactory soil while removing shoring and bracing and/or trench boxes.

9) After backfilling, maintain temporary surface restoration per GA Standard No. 1401 until permanent repaving is complete. No separate payment shall be made for replaced pavement.

15. Disinfection of Water Mains

a. New and existing pipelines and appurtenances shall be disinfected before placing into service. Disinfection can be conducted in conjunction with the pressure test.

b. Before the main is chlorinated, it shall be filled to eliminate air pockets and shall be flushed to remove particulates.

c. During disinfection of the water mains, an appropriate cross-connection control device, consistent with the degree of hazard, shall be provided for backflow protection of the active distribution system.

d. Chlorination: Sterilize using only potable water with calcium hypochlorite (HTH), 1% chlorine solution, or other products acceptable to the Utility Owner and GDOT Project Manager and Department of Public Health. Comply with AWWA C651 including Section 9 procedures on final connections to existing mains.

1) The chlorine solution used for disinfection of water mains shall have a free chlorine residual concentration not less than 25 mg/L or in accordance with The Facility Owner's Standard Specifications.

2) Add enough disinfectant to provide a chlorine residual of not less than 10 parts per million (ppm) in 24 hours or as required in The Facility Owner's Standard Specifications. All valves and hydrants shall be operated to ensure disinfection of the appurtenances.

3) At the end of 24 hours, check the chlorine residual. If it is less than 10 ppm, add additional chlorine and check the line again after 24 hours.

e. After the applicable retention period, the chlorinated water must not be disposed in a manner that will harm the environment. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite or Sodium Thiosulfate can be used to neutralize the chlorine residual remaining in the water to be wasted.

f. After sterilization, flush the line with potable water until the chlorine residual is equal to the existing system.

1) After final flushing and before the water main is placed into service, water samples shall be collected from the main and tested for microbiological quality in accordance with the Georgia Rules for Safe Drinking Water. Samples shall be taken in the presence of the Utility Owner and GDOT Project Manager.

2) When test results are not satisfactory, the pipeline shall be flushed and disinfected again as necessary without additional compensation until satisfactory results are obtained.

H. Laying Service Lines and Appurtenances

1. Except as modified in this Section, construct and install service connection assemblies and lines according to the Plans and the requirements for laying water mains. Install service lines at locations shown on the Plans or where designated by the Utility Owner and GDOT Project Manager.

2. Install new pipe from the water main to the final location of the meter or to points designated by the Utility Owner and GDOT Project Manager to connect with existing or future service lines on abutting property.
3. No water service connections shall be performed until the main is tested and disinfected. Water service lines shall be tested and disinfected prior to connection to the main.
4. If required, install water service line inside casing pipe according to the Plans or The Facility Owner's specification document.
5. At roads, paved drives, retaining walls, and other paved areas, install service tubing or casing pipe by pushing, pulling, or augering techniques. At all other locations, install service tubing by trenching and backfilling unless directed otherwise by GDOT.
6. Service line installation includes all connections using saddles, unions, valves, fittings, corporation stops, curb stops, casing, and any and all appurtenant work required to provide a complete water service connection.
7. Excavate for service lines as specified in Subsection 670.3.05 with the following exceptions:
    a. Ensure that trenches under pavements and across driveways are deep enough to provide at least 48 in (1.2 m) of cover, unless otherwise specified by The Facility Owner's Standard Specifications or directed by the Utility Owner and GDOT Project Manager.
    b. At other areas, trench depth and backfill cover may be adjusted at the discretion of the Utility Owner and GDOT Project Manager to provide at least 18 in (450 mm) of cover.
8. Backfill service lines as specified in Subsection 670.3.05.
9. All service lines, fittings, and appurtenances necessary for the water service connections shall be installed and backfilled in accordance with the manufacturer's recommendations and as per The Facility Owner's Standard Specifications and standard details.

I. Cutting and Capping Existing Water Mains

1. Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Plans or directed by the Utility Owner or GDOT Project Manager. Provide a watertight pipe cap or plug and restraint mechanism to seal off existing mains indicated to remain in service. If water main is to be abandoned or removed and not specified to be grout filled, seal ends with a pipe cap or plug or with a masonry plug and minimum 6-inch (150 mm) cover of concrete on all sides around the end of the pipe.
2. The Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged.
3. Abandoned manholes and water mains greater than 6-inch (150 mm) shall be filled with flowable fill per Section 600 at the locations indicated on the Plans. Air release valves and water service connections along the abandoned main shall be plugged prior to grouting. Prior to backfilling, the bottom of the manhole shall be broken up in such a manner that water will readily pass through. The top portion of the manhole structure shall be removed in order to establish a minimum of 3 feet cover from subgrade or finished grade when not under the pavement and filled with sand or suitable backfill.
4. Water mains shall be flushed prior to placement of flowable fill. Use concrete or grout pumps capable of continuous delivery at planned placement rate with sufficient pressure to overcome friction and fill the sewer main.

J. Relocating, Adjusting, and Removing

1. Fire Hydrant Assemblies
    a. Relocate, adjust to grade, or remove fire hydrant assemblies including valve and valve boxes according to the Plans or as designated by the Utility Owner and GDOT Project Manager.
    b. Protect items during removal and relocation. Replace lost or damaged Items at no expense to GDOT or the Utility Owner.
    c. Disconnect each joint before removing items from the trench.

d. Install relocated fire hydrant assemblies with tapping sleeve, and as specified herein for new fire hydrant assemblies.
e. Test for leakage, adjust, and retest until no leaks appear.
f. Backfill as specified in Subsection 670.3.05.
g. Consider valve boxes part of the valve assembly and remove them intact with the valve.

2. Water Valves and Boxes
   a. Adjust or remove water valves and valve boxes according to the Plans or as designated by the Utility Owner and GDOT Project Manager.
   b. Protect items during adjustment or removal. Replace lost or damaged Items at no expense to GDOT or the Utility Owner.
   c. Disconnect each joint before removing items from the trench.
   d. Test for leakage, adjust, and retest until no leaks appear.
   e. Backfill as specified in Subsection 670.3.05.
   f. Consider valve boxes part of the valve assembly and remove them intact with the valve.
3. Existing Water Meters and Boxes
   a. Relocate existing water meters and boxes according to the Plans or the Utility Owner and GDOT Project Manager.
   b. To relocate water meters, remove the existing meter, associated backflow preventer, and box and replace with a short section of pipe.
   c. Inspect along with the Utility Owner and GDOT Project Manager each meter and backflow preventer before removal to determine the condition of each.
   d. Unless specified otherwise in the Plans or The Facility Owner's Standard Specifications, new water meters and backflow preventers shall be furnished by the Contractor as necessary if these devices are deemed unsuitable for reuse. Contractor shall provide new water meter boxes if deemed unsuitable for reuse. The Contractor shall coordinate delivery of the water meters and backflow preventers to correspond to construction operations to minimize service interruptions.
   e. Relocation of water meters and boxes shall include without additional compensation, required pipe, unions and appurtenances, adapter fittings, necessary storage protection, and installation of meter, backflow preventer, meter box, and curb stop in the existing service line.
4. Existing Water Service Lines
   a. Water lines shall be adjusted to grade by excavating the existing lines, lowering or raising the lines, and backfilling according to the Plans or the Utility Owner and GDOT Project Manager.
   b. Furnish new materials or fittings required for the adjustment without additional compensation.
   c. Change connections at the main that result from this work.
   d. Repair leaks and damage caused by the operations at no expense to GDOT.
   e. When retaining a water meter where an existing service line is to be adjusted, adjust the existing meter and box to the proper grade without additional compensation.
5. Other Water Appurtenances
   a. Relocate, adjust to grade, or remove water main appurtenances including but not limited to air release valves, backflow preventers, pressure reducing/sustaining valves according to the Plans or as designated by the Utility Owner and GDOT Project Manager.
6. Utility related items identified on the Plans to be salvaged are the property of the Utility Owner. Contractor shall coordinate with Utility Owner on delivery of salvaged materials. Should the Utility Owner choose to not accept these materials they shall be removed from the project site as soon as practical.

K. Aerial Crossings

1. Support must be provided for all joints in pipes utilized for aerial crossings. The supports must be installed to prevent frost heave, overturning, and settlement. Precautions against freezing, such as insulation, shall be provided.

2. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the crossing shall meet all requirements of the agencies that own or have jurisdiction over such structures.
3. Aerial installations shall be installed to avoid or minimize stream blockage during normal high water events.
4. Underground valves shall be provided at both ends of the aerial crossing so that the section can be isolated for testing or repair. The valves shall be restrained, easily accessible, and not subject to flooding. An air release/vacuum relief valve shall be installed at all high points along the aerial crossing.
5. Appropriate guards shall be installed at both ends of the aerial crossing to prevent public access to the pipe.

670.3.06 Quality Acceptance

A. Materials Certification

For certain products, assemblies and materials, not on GDOT QPL List, and in lieu of normal sampling and testing procedures by the Contractor, the Utility Owner, and GDOT may accept from the Contractor the manufacturer's certification with respect to the product involved under the conditions set forth in the following paragraphs:

1. Material certifications shall be provided to GDOT, who shall distribute to the Utility Owner. Material certifications shall be approved by GDOT and the Utility Owner prior to construction. The certification shall state/specify that the named product conforms to these specifications and requirements of the Utility Owner and GDOT, and representative samples thereof have been sampled and tested as specified.
2. The certification shall either:
   a. Be accompanied by a certified copy of the test results, or
   b. Certify such test results are on file with the manufacturer and will be furnished to the Utility Owner and GDOT Project Coordinators upon demand.
3. The certification shall state/specify the name and address of the manufacturer and the testing agency and the date of tests; and sets forth the means of identification which shall permit field determination of the product delivered to the project as being the product covered by the certification.
4. Submit certification in triplicate with two copies of the covered product to the GDOT Project Coordinator, and one copy sent to GDOT's State Materials and Research Engineer at 15 Kennedy Drive, Forest Park, Georgia. The certification shall specify the project number and contract ID number. No certificate shall be required for Portland cement when furnished from a manufacturer approved by GDOT.
5. GDOT or the Utility Owner will not be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.
6. GDOT and the Utility Owner reserve the right to require samples and test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer. Any materials that fail to meet specification requirements will be rejected.
7. In accordance with the BUY AMERICA requirements of the Federal regulations (23 U.S.C. 313 and 23 CFR 635.410) all manufacturing processes for steel and iron products or predominantly of steel or iron (at least 90% steel or iron content) furnished for permanent incorporation into the work on this project shall occur in the United States. The only exception to this requirement is the production of pig iron and the processing, pelletizing and reduction of iron ore, which may occur in another country. Other than these exceptions, all melting, rolling, extruding, machining, bending, grinding, drilling, coating, etc. must occur in the United States.
   a. Products of steel include, but are not limited to, such products as structural steel piles, reinforcing steel, structural plate, steel culverts, guardrail steel supports for signs, signals and luminaires. Products of iron include, but are not limited to, such products as cast iron frames and grates and ductile iron pipe. Coatings include, but are not limited to, the applications of epoxy, galvanizing and paint. The coating material is not limited to this clause, only the application process.

b. Records to be provided by the Contractor for this certification shall include a signed mill test report and a signed certification by each supplier, distributor, fabricator, and manufacturer that has handled the steel or iron product affirming that every process, including the application of a coating, performed on the steel or iron product has been carried out in the United States of America, except as allowed by this Section. The lack of these certifications will be justification for rejection of the steel and/or iron product or nonpayment of the work.

c. The requirements of said law and regulations do not prevent the use of miscellaneous steel or iron components, subcomponents and hardware necessary to encase, assemble and construct the above products, manufactured products that are not predominantly steel or iron or a minimal use of foreign steel and iron materials if the cost of such materials used does not exceed one-tenth of one percent (0.1%) of the total contract price or $2,500.00, whichever is greater.

B. Flushing

1. Prior to testing, water mains shall be cleaned and flushed to remove all sand and foreign matter. Water used for filling and cleaning shall be from an approved potable water source. Sufficient flushing water shall be introduced into the mains to produce a scouring velocity of not less than 3.5 feet per second to resuspend the solids, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible. The Contractor shall dispose of all water used for flushing without causing a nuisance or property damage.
2. In the event that the Contractor cannot obtain the flushing velocity, a poly-pig swab may be used to clean the pipeline. The Contractor shall submit pigging plan to the Utility Owner and GDOT for review. The plan shall include type of pig material, water flow rate, discharge points, poly-pig detector and retrieval options.

C. Hydrostatic Testing of Water Mains

1. When the Utility Owner and GDOT Project Manager approve a section of pipe for testing, the Contractor shall furnish the materials, equipment, and labor to conduct the pressure and leakage tests. Use a test pump, pressure gauge, and a means of measuring the water necessary to maintain the required pressure during the prescribed testing time. All pressure and leakage testing shall be done in the presence of the Utility Owner and GDOT Project Coordinators as a condition precedent to the approval and acceptance of the system. All pipes shall have been thoroughly flushed prior to testing. Simultaneous or separate pressure and leakage tests may be performed.
2. All water for testing and flushing shall be potable water provided by the Contractor, at no cost to the Utility Owner or GDOT, from an approved source. Flow velocity during line filling shall not exceed 2 feet (0.6 m) per second (fps).
3. Testing Requirements
   a. Water mains shall be tested in sections between valves, thereby, testing each valve for secure closure. Testing shall be done immediately after installation and backfilling has been completed.
   b. The mains shall be tested in accordance with the latest revision of AWWA C600 for ductile iron and C605 for PVC under an average hydrostatic pressure of the greater of 1.5 times the maximum working pressure or 150 psi as measured at the lowest point in the system for a minimum of 2 hours. Pressure shall be maintained until all sections under testing have been checked for evidence of leakage.
   c. While the system is being filled with water, air shall be carefully and completely exhausted. If permanent air vents are not located at all high points, the Contractor shall install corporation stops or fittings and valves at such points at no additional expense to the Utility so the air can be expelled as the pipe system is slowly filled.
   d. Makeup water shall be added, as required, to maintain the pressure within 5 psi of the test pressure. The quantity used shall be measured by pumping from a calibrated container. The maximum amount of makeup water allowed shall be determined by the following formula:

$$L = \frac{SD\ P^{0.5}}{148{,}000}$$

in which,

L = Allowable Leakage in gallons per hour

S = Length of pipe being tested in feet

D = Nominal pipe diameter in inches

P = Average test pressure during the test in psi gauge

e. Visible leaks shall be corrected regardless of total leakage shown by test. All pipe fittings and other materials found to be defective under test shall be removed and replaced. Lines which fail to meet test requirements shall be repaired and retested as necessary until test requirements are met. No additional compensation shall be made for repairs or retesting.

670.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

670.4 Measurement

Incidentals including excavation, rock removal, backfilling, disinfection, testing, temporary water connections, pavement removal, pavement replacement, and other incidentals required for the installation of water distribution items are not measured for separate payment and shall be included in the applicable Pay Items below. Water mains, service lines, and other associated Items of work in this Specification, complete, in place, and accepted, are measured for payment as follows:

A. Ductile Iron Water Mains

Ductile iron water mains shall be measured in linear feet (meters) for each size, thickness class, and type (restrained, non-restrained) installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

B. PVC Water Main

PVC water mains shall be measured in linear feet (meters) for each size and type (restrained, non-restrained) installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

C. Fusible PVC Water Main

Fusible PVC water mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

D. HDPE Water Main

HDPE water mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

E. Ductile Iron Fittings

Ductile iron fittings are considered subsidiary to the water line in which they are used and are not measured for separate payment. This Item includes, but is not limited to, wyes, tees, bends, crosses, sleeves, plugs and caps, and reducers.

F. Restrained Joints

Joint restraints used with the installation of PVC or ductile iron pipe are considered subsidiary to the water line in which they are used and are not measured for separate payment.

G. Gate Valves

Gate valves shall be measured on an individual basis for each size valve and box assembly acceptably installed.

H. Butterfly Valves

Butterfly valves shall be measured on an individual basis on the number of each size valve and box assembly acceptably installed.

I. Tapping Sleeve and Valve Assembly

Tapping sleeve and valve assemblies shall be measured on an individual basis on the number of each size tapping sleeve and valve assembly acceptably installed.

J. Double Strap Saddle

Double strap saddles shall be measured on an individual basis on the number of each size double strap saddle acceptably installed.

K. Fire Hydrant Assemblies

Fire hydrant assemblies shall be measured on an individual basis on the number of hydrants acceptably installed.

L. Water Service Lines

Service lines shall be measured in linear feet (meters) for each size of service pipe installed. Measurements are made from end to end and from center of lines to ends of branches and include tapping saddle, sleeve, valves, service connection assemblies, sleeves, adapters, and fittings.

M. Air Release Valve Assembly

Air release valve assemblies shall be measured on an individual basis on the number of each size and type of air release valve assembly acceptably installed.

N. Pressure Reducing / Sustaining Valve

Pressure reducing/sustaining valve shall be measured on an individual basis on the number of each pressure reducing/sustaining valves acceptably installed.

O. Blow-Off Assemblies

Blow-off assemblies shall be measured on an individual basis on the number of each blow-off assembly acceptably installed.

P. Backflow Prevention Assembly

Backflow prevention assemblies shall be measured on an individual basis on the number of each size and type backflow preventer acceptably installed.

Q. Water Meter

Water meters shall be measured on an individual basis on the number of each size meter acceptably installed.

R. Steel Casing

Steel casing pipe of the wall thickness and diameter specified shall be measured by the linear foot for each size and thickness of steel casing pipe installed. Measurement shall be horizontally above the centerline of the casing.

S. Relocation of Existing Fire Hydrant Assemblies, Air Release Valves, Water Meters, Water Backflow Preventers, Pressure Reducing or Sustaining Valves, Water Valves and Water Meter including Bypass and Vault

Relocation of existing fire hydrant assemblies, air release valves, water meters, backflow preventers, pressure reducing or sustaining valves, water valves, and water meter including bypass and vault shall be measured on an individual basis on the number of each acceptably relocated including relocation and final adjustment of boxes.

T. Adjustment of Existing Meter Boxes and Valve Boxes to Grade

Adjustment of existing meter boxes and valve boxes adjusted to grade in their original locations shall be measured on an individual basis on the number of each acceptably adjusted in accordance with Section 611.

U. Adjustment of Blow-Off Assembly

Adjustment of blow-off assembly to grade in their original locations shall be measured on an individual basis on the number of each acceptably adjusted.

V. Adjustment of Existing Fire Hydrant Assembly

Adjustment of existing fire hydrant assembly to grade in their original locations shall be measured on an individual basis on the number of each acceptably adjusted.

W. Adjustment of Existing Backflow Preventers

Adjustment of existing backflow preventers to grade in their original locations shall be measured on an individual basis on the number of each acceptably adjusted.

X. Removal of Water Meters, Fire Hydrant Assemblies, Backflow Preventers, Water Valves, and Air Release Valves

Removal of existing water meters and boxes, fire hydrants assemblies, backflow preventers, water valves, and air release valves, shall be measured on an individual basis on the number of each removed.

Y. Adjustment of Water Service Lines

Adjustment of water service lines shall be measured in linear feet (meters) of service line pipe lowered or raised, and shall include the length of valves, fittings, meters, boxes, and other appurtenances. Measurements are made from end to end of actual adjustments.

Z. Concrete Thrust Blocks

Concrete thrust blocking installed shall be measured as indicated in Section 500 per cubic yard of concrete acceptably installed. When Concrete Thrust Blocks is not shown as a pay item, include the cost of the work in the bid price for the appropriate item.

AA. Concrete Thrust Collars

Concrete thrust collars shall be measured on an individual basis on the number of each size thrust collar acceptably installed. When Concrete Thrust Collars is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

BB. Cut and Plug Existing Water Main

Cutting and plugging of existing water mains shall be measured on an individual basis per each instance of cutting and plugging existing mains as shown on the Plans.

CC. Removal of Water Mains

Unless specified removal of water mains shall be removed in accordance with Section 210. If specified removal of water mains shall be measured per linear foot for each size pipe actually removed in accordance with Section 610. Measurement shall be horizontally above the centerline of the pipe removed and shall include the length of valves and fittings.

DD. Line Stop

Line stops shall be measured on an individual basis on the number of each size line stop actually installed.

EE. Flowable Fill

Flowable fill shall be measured as indicted in Section 600 per cubic yard of flowable fill acceptably installed. When flowable fill is not shown as a pay item, include the cost of the work in the bid price for the appropriate item.

FF. Insertion Valve

Insertion valves shall be measured on an individual basis on the number of each size valve acceptably installed.

GG. Three-Dimensional (3D) Survey

Three-dimensional survey shall be measured as one lump sum for a complete and accepted survey. This item will be included in the overall pipe measurement. No separate payment for this work.

670.4.01 Limits

General Provisions 101 through 150.

670.5 Payment

The Contract Unit Price for each Item, complete and accepted, shall include all costs incidental to the construction of the Item according to the Plans and as specified in this Section. The unit prices bid shall include due allowance for the salvage value of all materials removed from existing or temporary lines and not installed in the completed work. All such surplus items shall become the property of the Contractor unless such surplus items are specified to be salvaged. Payment for any Item listed below is full compensation for the Item or Items complete in place.

A. Ductile Iron Water Mains

Ductile iron mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, joints and jointing materials, anchoring, warning tape, polyethylene encasement, protection of existing utilities, connections to existing water mains, sampling taps, temporary blow-offs, flushing, cleaning, pigging, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration and all work and materials necessary to place the pipe into service.

B. PVC Water Main

PVC water mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, anchoring, tracer wire, warning tape, protection of existing utilities, connections to existing water mains, sampling taps, temporary blow-offs, flushing, cleaning, pigging, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pipe into service.

C. Fusible PVC Water Main

Fusible PVC water mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, entry/exit pits, installation of pipe, joints and jointing materials, tracer wire, warning tape, mechanical joint adapters, protection of existing utilities, connections to existing water mains, fusion process materials and equipment, directional drilling materials and equipment, tracking system, assembling, welding, supporting, stringing, pulling, pigging, cleaning, sampling taps, temporary blow-offs, flushing, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, and restoration, and all incidentals necessary to place the pipe into service except where such items are shown to be paid for under a separate Pay Item.

D. HDPE Water Main

HDPE water mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, entry/exit pits, installation of pipe, tracer wire, warning tape, mechanical joint adapters, protection of existing utilities, connections to existing water mains, fusion process materials and equipment, directional drilling materials and equipment, tracking system, assembling, welding, supporting, stringing, pulling, pigging, cleaning, sampling taps, temporary blow-offs, flushing,

chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, and restoration, and all incidentals

necessary to place the pipe into service except where such items are shown to be paid for under a separate Pay Item.

E. Ductile Iron Fittings

Ductile iron fittings are considered subsidiary to the water line in which they are used and are not measured for separate payment as outlined in the manufacturers' catalogues and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of fittings, joints and jointing materials, anchoring, warning tape, polyethylene encasement, protection of existing utilities, flushing, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, all other related and necessary materials, work and equipment required to install a complete and operable pipeline fitting. This Item includes, but is not limited to, wyes, tees, bends, crosses, sleeves, plugs and caps, couplings, and reducers.

F. Restrained Joints

Restrained joints are considered subsidiary to the water line in which they are used and are not measured for separate payment as outlined in the manufacturers' catalogues and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting, shoring, installation of the restraint device, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the restrained joint.

G. Gate Valves

Gate valves shall be paid for at the unit price per each size gate valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the gate valves (including valve box), concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service.

H. Butterfly Valves

Butterfly valves shall be paid for at the unit price per each size butterfly valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the butterfly valves including valve box, concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration and all work and materials necessary to install the butterfly valve and place it in service.

I. Tapping Sleeve and Valve Assembly

Tapping sleeve and valves assemblies shall be paid for at the unit price per each size tapping sleeve and valve assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of tapping sleeves and valve assemblies including valve box, concrete pad or collar, valve marker, valve tag, polyethylene encasement, protection of existing utilities, tapping the potable water main, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and necessary hardware to install the tapping sleeve assembly and valve and place it in service.

J. Tapping Sleeve

Tapping sleeves shall be paid for at the unit price per each size tapping sleeve installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of tapping sleeves, concrete pad

or collar, valve marker, valve tag, polyethylene encasement, protection of existing utilities, tapping the potable water main, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill

materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and necessary hardware to install the tapping sleeve and place it in service.

K. Double Strap Saddle

Double strap saddles shall be paid for at the unit price per each size double strap saddle installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of double strap saddles, concrete pad or collar, valve marker, valve tag, polyethylene encasement, protection of existing utilities, tapping the potable water main, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and necessary hardware to install the double strap saddle.

L. Fire Hydrant Assembly

Fire hydrant assemblies shall be paid for at the unit price per each hydrant installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the fire hydrant assemblies (all configurations), vertical extensions, tapping sleeve, valve, hydrant lead piping, joint connections, fittings, tees, restraints, crushed stone drain, polyethylene encasement, protection of existing utilities, valve box, concrete pad or collar, valve identification disc, valve marker, valve tag, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the fire hydrant assembly and place it in service.

M. Water Service Line

Water service lines shall be paid for at the unit price per linear feet (meters) of the size service line installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of water service line, tracer wire, tapping saddle, sleeve, corporation stops, fittings, curb stops, casing pipe, plugging abandoned water service connection, removal of abandoned water service line, protection of existing utilities, locating and connection to existing or new water main, chlorine for disinfection, disinfection, sampling points, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the water service line into service. Water meter and box shall be paid for under a separate Pay Item.

N. Water Meter and Box

Water meters shall be paid for at the unit price per each size water meter installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the meter and box, adjustment to final grade, fittings, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

O. Backflow Prevention Assembly

Back flow prevention assemblies shall be paid for at the unit price per each type backflow preventer installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the backflow preventer, concrete vault, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

P. Air Release Valve Assembly

~~Air release valve assemblies shall be paid for at the unit price per each size and type of air release valve assembly~~

installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the air release assembly, tapping saddle, isolation valve, reducers, piping, restraints, fittings, tracer wire, concrete manhole or vault, ring and cover, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the air release assembly into service.

Q. Pressure Reducing / Sustaining Valve

Pressure reducing / sustaining valve shall be paid for at the unit price per each size and type of pressure reducing / sustaining valve installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the pressure reducing / sustaining valve, reducers, piping, restraints, fittings, tracer wire, concrete manhole or vault, ring and cover, tracer wire, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pressure reducing / sustaining valve into service.

R. Blow-Off Assembly

Blow-off assemblies shall be paid for at the unit price per each blow-off assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the blow-off assembly, valves, valve boxes, concrete pad or collar, piping, restraints, fittings, tracer wire, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the blow-off assembly into service.

S. Steel Casing

Steel casing pipe shall be paid for at the unit price per linear foot according to the diameter and thickness of the steel casing installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, steel casing pipe, skid, steel straps, coatings, casing spacers, end seals, boring and jacking pits, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the steel casing except where such items are shown to be paid for under a separate Item. The carrier pipe shall be paid from other applicable Pay Item.

T. Relocation of Existing Air Release Valve

Relocation of air release valves shall be paid for at the unit price per each air release valve assembly relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing air release valve assembly, installation at another location, piping, restraints, tracer wire, fittings, adjustment to final grade, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration and all work necessary to locate, remove and relocate the air release valve except where such items are shown to be paid for under a separate Pay Item.

U. Relocation of Existing Fire Hydrant Assembly

Relocation of fire hydrants shall be paid for at the unit price per each hydrant assembly relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing fire hydrant assembly, installation at another location, vertical extensions, hydrant lead piping, joint connections, fittings, tees,

restraints, crushed stone drain, polyethylene encasement, valve box, concrete pad or collar, valve identification disc, valve marker, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling,

backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove and relocate the hydrant.

V. Relocation of Existing Backflow Prevention Devices

Relocation of backflow prevention devices shall be paid for at the unit price per each backflow preventer relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing backflow preventer, installation at another location, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove and relocate the backflow prevention device. The service line from the main to the relocated backflow preventer shall be paid for under a separate Pay Item.

W. Relocation of Water Meter and Box

Relocation of existing water meter and boxes shall be paid for at the unit price of each water meter and box relocated and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing water meter and box, installation at another location, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to relocate the water meter and box except where such items are shown to be paid for under a separate Item. The new service line from the main to the relocated meter shall be paid for under a separate Pay Item.

X. Relocation of Water Meter, including Bypass and Vault

Relocation of existing water meter including bypass and vault shall be paid for at the unit price of each water meter including bypass and vault relocated and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing water meter, bypass and vault, installation at another location, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to relocate the water meter including bypass and vault except where such items are shown to be paid for under a separate Item. The new service line from the main to the relocated meter, bypass and vault shall be paid for under a separate Pay Item.

Y. Relocation of Pressure Reducing/Sustaining Valve

Relocation of pressure reducing/sustaining valve shall be paid for at the unit price of each pressure reducing/sustaining valve relocated and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing water meter and box, installation at another location, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to relocate the water meter and box except where such items are shown to be paid for under a separate Item. The new service line from the main to the relocated pressure reducing/sustaining valve shall be paid for under a separate Pay Item.

Z. Relocation of Water Valve and Box

Relocation of existing water valves and boxes shall be paid for at the unit price of each water valve and box relocated and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing water meter and box, installation at another location, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials

necessary to relocate the water meter and box except where such items are shown to be paid for under a separate Item. The new service line from the main to the relocated valve shall be paid for under a separate Pay Item.

AA. Adjustment of Existing Water Service Line

Adjustment of existing water service lines shall be paid in accordance with Section 611, for at the unit price per linear foot of service line adjusted and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of service line, tracer wire and splices, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the service line except where such items are shown to be paid for under a separate Pay Item.

BB. Adjustment of Existing Water Valve Boxes to Grade

Adjustment of existing valve boxes shall be paid for in accordance with Section 611, at the unit price per each valve box adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, valve case and lid, trench adapter and operating nut extensions/reductions, tracer wire and splices, tracer wire riser and threaded plug, concrete pad, valve identification disc, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the valve box.

CC. Adjustment of Blow-off Assembly

Adjustment of existing blow-off assemblies shall be paid for at the unit price per each blow-off adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, valve case and lid, trench adapter and operating nut extensions/reductions, tracer wire and splices, tracer wire riser and threaded plug, piping, concrete pad or collar, valve identification disc, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the blow-off assembly.

DD. Adjustment of Existing Water Meter Boxes to Grade

Adjustment of existing meter boxes shall be paid for at the unit price per each meter box adjusted to finished grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of water meter box to final grade, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the water meter box.

EE. Adjustment of Backflow Preventer

Adjustment of existing backflow preventers shall be paid for at the unit price per each backflow preventer adjusted to finished grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of backflow preventer to final grade, adjustment of backflow preventer vault to final grade, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the water meter box.

FF. Adjustment of Existing Fire Hydrant Assembly to Grade

Adjustment of existing fire hydrants shall be paid for , at the unit price per each hydrant adjusted to finished grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of hydrant, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the hydrant.

GG. Removal of Water Valve and Box

Removal of water valves shall be paid for at the unit price per each valve removed and shall cover the cost for all

materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing water valve and box, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed valves identified to be salvaged, and all work necessary to remove the valve and box.

HH. Removal of Water Meter and Box

Removal of water meters shall be paid for at the unit price per each meter removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing water meter and box, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed meters and boxes identified to be salvaged, and all work necessary to remove the meter.

II. Removal of Fire Hydrant Assembly

Removal of fire hydrant assemblies shall be paid for at the unit price per each hydrant assembly removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing fire hydrant assembly, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed hydrants identified to be salvaged, and all work necessary to remove the hydrant.

JJ. Removal of Air Release Valve

Removal of air release valves shall be paid for at the unit price per each air release valve removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of air release valve assemblies, piping, concrete manholes or vaults, and fabricated enclosures, backfilling, backfill materials, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of air release valves identified to be salvaged, and all work necessary to remove the air release valve.

KK. Removal of Backflow Prevention Devices

Removal of backflow prevention devices shall be paid for at the unit price per each backflow preventer removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing backflow preventer and vault, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed backflow preventers identified to be salvaged, and all work necessary to remove the backflow preventers.

LL. Concrete Thrust Blocks

Concrete thrust blocks shall be paid for at the unit price per cubic yard of concrete complete in place as indicated in Section 500 and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, concrete, forming, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install a complete thrust block. When Concrete Thrust Blocks is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

MM. Concrete Thrust Collars

Concrete thrust collars shall be paid for at the unit price per each size of thrust collar and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring**,** reinforced concrete thrust collars, retainer glands, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install a complete thrust collar. When Concrete Thrust Collar is not shown as a pay item, include the cost of the work in the bid price for the appropriate item.

NN. Removal of Water Main

Removal of water mains shall be paid for at the unit price per linear foot of the size of water main to be removed in

accordance with Section 610 and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to locate, remove and dispose of the pipe and associated appurtenances. Unless indicated for removal in a separate Pay Item, appurtenances to be removed shall include but not be limited to fittings, isolation valves, air release valves, valve boxes, blow-offs, steel casings, casing spacers, fire hydrant assemblies, water service lines, water meter boxes, thrust blocks, and concrete. All such surplus items shall become the property of the Contractor unless specified to be salvaged by the Utility Owner.

OO. Cut and Plug Existing Water Main

Cutting and plugging of existing water mains shall be paid for at the unit price per each installation and shall cover all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to cut and plug existing water mains, except where such items are shown to be paid for under a separate Pay Item.

PP. Line Stops

Line stops shall be paid for at the unit price per each size line stop installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the line stop assemblies, valves, valve boxes, fittings, restraints, protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service.

QQ. Flowable Fill

Flowable fill shall be paid for at the unit price per cubic yard of flowable fill complete in place as indicated in Section 600 and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, flushing, plugging air release valves and service connections, installation of flowable fill, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service. When flowable fill is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

RR. Insertion Valve

Insertion valves shall be paid for at the unit price per each size valve inserted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the valve, valve boxes, fittings, restraints, concrete pad or collar, valve identification disc, valve marker, polyethylene encasement**,** protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the insertion valve and place it in service.

SS. Three-Dimensional (3D) Survey

Three-dimensional survey cost will be included in the overall pipe measurement and no separate payment for this work will be made, and it shall cover the costs for all non-destructive methods of locating installed utilities and associated electronic deliverables per Utility Owner specifications.

Payment will be made under:

Item No. 670	Water Main_____in (mm)	Per linear foot (meter)

Item No. 670	Gate Valve_____in (mm)	Per each
Item No. 670	Tapping Sleeve and Valve Assembly __ in (mm) x____in (mm)	Per each

Item No. 670	Fire Hydrant	Per each
Item No. 670	Water Service Line_____in (mm)	Per linear foot (meter)
Item No. 670	Relocate Existing Fire Hydrant	Per each
Item No. 670	Relocate Existing Air Release Valve Assembly	Per each
Item No. 670	Relocate Existing Water Valve including Box	Per each
Item No. 670	Relocate Existing Water Meter including Box	Per each
Item No. 670	Adjust Water Service Line to Grade	Per linear foot (meter)
Item No. 670	Remove Existing Water Meter including Box	Per each
Item No. 670	Steel casing_____in (mm)	Per linear foot (meter)
Item No. 670	Butterfly valve_____in (mm)	Per each
Item No. 670	Double strap saddle_____in (mm) x_____in (mm)	Per each
Item No. 670	Tapping Valve, ___in(mm)	Per each
Item No. 670	Air Release Valve Assembly_____in (mm)	Per each
Item No. 670	Water Meter, ___in	Per each
Item No. 670	Insertion Valve, ____in	Per each
Item No. 670	Line Stop_____in (mm)	Per each
Item No. 670	Cut and Plug Existing Water Main	Per each
Item No. 670	Blow-Off Assembly, Complete	Per each
Item No. 670	Pressure Reducing/Sustaining Valve	Per each
Item No. 670	Backflow Prevention Assembly	Per each
Item No. 670	Concrete Thrust Collar, _____in	Per each
Item No. 670	Relocate Backflow Prevention Assembly	Per each
Item No. 670	Relocate Existing Water Meter, including Bypass & Vault_____in (mm)	Per each
Item No. 670	Relocate Pressure Reducing/Sustaining Valve	Per each
Item No. 670	Adjust Blowoff Assembly	Per each
Item No. 670	Adjust Fire Hydrant Assembly	Per each
Item No. 670	Adjust Backflow Preventer	Per each
Item No. 670	Remove Existing Water Valve, including Box	Per each
Item No. 670	Remove Existing Fire Hydrant	Per each
Item No. 670	Remove Existing Backflow Preventer	Per each
Item No. 670	Remove Existing Air Release Valve	Per each

670.5.01 Adjustments

General Provisions 101 through 150.

CERTIFICATION OF COMPLIANCE WITH THE STATE OF GEORGIA'S

SEXUAL HARASSMENT PREVENTION POLICY

The State of Georgia promotes respect and dignity and does not tolerate sexual harassment in the workplace. The State is committed to providing a workplace and environment free from sexual harassment for its employees and for all persons who interact with state government. All State of Georgia employees are expected and required to interact with all persons including other employees, contractors, and customers in a professional manner that contributes to a respectful work environment free from sexual harassment. Furthermore, the State of Georgia maintains an expectation that its contractors and their employees and subcontractors will interact with entities of the State of Georgia, their customers, and other contractors of the State in a professional manner that contributes to a respectful work environment free from sexual harassment.

Pursuant to the State of Georgia's Statewide Sexual Harassment Prevention Policy (the "Policy"), all contractors who are regularly on State premises or who regularly interact with State personnel must complete sexual harassment prevention training on an annual basis.

A contractor, including its employees and subcontractors, who have violated the Policy, including but not limited to engaging in sexual harassment and/or retaliation may be subject to appropriate corrective action. Such action may include, but is not limited to, notification to the employer, removal from State premises, restricted access to State premises and/or personnel, termination of contract, and/or other corrective action(s) deemed necessary by the State.

(i) If Contractor is an individual who is regularly on State premises or who will regularly interact with State personnel, Contractor certifies that:

(a) Contractor has received, reviewed, and agreed to comply with the State of Georgia's Statewide Sexual Harassment Prevention Policy located at http://doas.ga.gov/human-resources-administration/board-rules-policy-and-compliance/jointly-issued-statewide-policies/sexual-harassment-prevention-policy;

(b) Contractor has completed sexual harassment prevention training in the last year; or will complete the Georgia Department of Administrative Services' sexual harassment prevention training located at http://doas.ga.gov/human-resources-administration/sexual-harassment-prevention/hr-professionals/employee-training (scroll down to section for entities without a LMS section) or this direct link https://www.youtube.com/embed/NjVt0DDnc2s?rel=0 prior to accessing State premises and prior to interacting with State employees; and on an annual basis thereafter; and,

(c) Upon request by the State, Contractor will provide documentation substantiating the completion of sexual harassment training.

(ii) If Contractor has employees and subcontractors that are regularly on State premises or who will regularly interact with State personnel, Contractor certifies that:

(a) Contractor will ensure that such employees and subcontractors have received, reviewed, and agreed to comply with the State of Georgia's Statewide Sexual Harassment Prevention Policy located at http://doas.ga.gov/human-resources-administration/board-rules-policy-and-compliance/jointly-issued-statewide-policies/sexual-harassment-prevention-policy;

(b) Contractor has provided sexual harassment prevention training in the last year to such employees and subcontractors and will continue to do so on an annual basis; or Contractor will ensure that such employees and subcontractors complete the Georgia Department of Administrative Services' sexual harassment prevention training located at http://doas.ga.gov/human-resources-administration/sexual-harassment-prevention/hr-professionals/employee-training (scroll down to section for entities without a LMS section) or this direct link https://www.youtube.com/embed/NjVt0DDnc2s?rel=0 prior to accessing State premises and prior to interacting with State employees; and on an annual basis thereafter; and

(d) Upon request of the State of the Georgia Department of Transportation, Contractor will provide documentation substantiating such employees and subcontractors' acknowledgment of the State of Georgia's Statewide Sexual Harassment Prevention Policy and annual completion of sexual harassment prevention training.

[Contractor Name]

_____
Signature of Contractor

_____
Printed Name of Signee

_____
Title

Submitted: April 5, 2021

LUMPKIN COUNTY

SPECIAL PROVISION

Project Name: SR 60 BUS & OAK GROVE ROAD ROUNDABOUT
LUMPKIN COUNTY

Section 108 – Prosecution and Progress

Retain section 108 as written and add the following:

108.08 Failure or Delay in Completing Work on Time

C. Intermediate Completion Schedule

An overall Completion Date is established for this Project. However, it is necessary to complete certain portions of The Work at an earlier time.

For this Project, the following items of work and corresponding intermediate completion times are required:

1. All work on the roundabout to install the Landscaping shall be complete by October 15, 2022. Failure to complete The Work as noted will result in the assessment of Liquidated Damages in the amount of $1000.00 per calendar day until the roundabout is ready for the plantings.
2. Failure to cover milled areas as noted in Section 150.6.B will result in the assessment of Liquidated Damages in the amount of $1,000 per calendar day.
3. Failure to maintain school flashing beacon assembly as in Section 150.6.C will result in the assessment of Liquidated Damages in the amount of $1,000 per calendar day.
4. SR 60 Business traffic may be detoured as noted in Section 150.6.D. Time Charges begin the day traffic is shifted to the detour and continue until the roadway is re-opened to safe and convenient use for the traveling public. Failure to reopen the roadway in accordance with the above will result in the assessment of Liquidated Damages at the rate of $5,000 per Calendar Day or portion thereof.
5. Failure to make initial planting of Landscaping items by October 31, 2022, as detailed in Special Provision Section 702, will result in the assessment of Liquidated Damages in the amount of $500.00 per calendar day until compliance.
6. Failure to maintain Landscaping Pay Items and place mulch application as required through November 30, 2022, as detailed in Special Provision Section 702, will result in the assessment of Liquidated Damages in the amount of $500.00 per calendar day until the work is complete.

D. Restrictive Work Hours

1. Failure to re-open travel lanes as specified in Special Provision 150.6.A result in the assessment of Liquidated Damages in the amount of $1,000 per hour or portion thereof.

These rates are in addition to Liquidated Damages that may be assessed in accordance with Subsection 108.08 for failure to complete the overall project.

(District Construction Office)

April 5, 2021

LUMPKIN COUNTY

SPECIAL PROVISION

Project Name: SR 60 BUS & OAK GROVE ROAD ROUNDABOUT
LUMPKIN COUNTY

Section 150 – Traffic Control

Retain section 150 as written and add the following:

SECTION 150.6 SPECIAL CONDITIONS:

A. Lane Closures

1. SR 60 Business & Oak Grove Road

   a. Single Lane Closures and Flagging Operations

      1. Single lane closures are allowed between the hours of 8:30 am to 4:30 pm and 7:00 pm to 6:00 am, Monday through Thursday.
      2. Single lane closures and flagging operations are allowed between the hours of 8:30 am to 3:30 pm on Friday and 7:00 pm Friday to 8:00 am Saturday.
      3. Single lane closures and flagging operations are allowed between the hours of 8:00 pm Saturday to 8:00 am Sunday.
      4. Single lane closures and flagging operations are allowed between the hours of 6:00 pm Sunday to 6:00 am Monday.

   b. Double lane closures are not allowed at any time.

2. Single Lane Closures and Flagging Operations (When is school is in session for day time- all other times listed in 150.6.A.1 apply)

   a. Single lane closures are allowed between the hours of 8:30 am to 3:00 pm Monday through Friday.

3. Leaf Season & Holiday Restrictions

   a. Between October 15th and November 30th on a yearly basis, no lane closures or flagging operations will be allowed between 7:00 pm to 9:00 pm Friday, 8:00 am to 9:00 pm Saturday, and 8:00 am to 10:00 pm Sunday.

4. Gold Rush & other Festivals

   a. There will be no lane closures or flagging operations allowed between 7:00 pm to 10:00 pm Friday, 8:00 am to 10:00 pm Saturday, and 8:00 am to 10:00 pm Sunday during the Gold Rush Festival and any other festivals being held by the City of

Dahlonega on a year basis. The Contractor shall visit the City of Dahlonega official website to obtain schedules and plan The Work accordingly. Failure to schedule The Work as noted shall result in the rescheduling with no consideration for any additional monies nor Contract Time. The Contractor may request in writing to Lumpkin County 2 weeks in advance of any planned festivals for a waiver of this requirement. A request for waiver does not constitute an approval.

B. Milled Surfaces

The contractor shall cover milled surfaces before they are open to traffic.

C. Maintaining School Flashing Beacon

The Contractor shall maintain the existing school flashing beacon assembly within the Project Limits at all times. This may require the installation of temporary poles, conduit, wire, and temporary relocation until the new school flashing beacon assembly can be activated.

D. Detours and Staging

The Contractor may close, and detour SR 60 Business as shown in the detour plan between May 24th – August 3rd, 2021 for the full depth construction and adjustment of grade of SR 60 Business. At all other times SR 60 Business and Oak Grove Road shall remain open. The Contractor shall advise the Georgia Department of Transportation Area 4 Office (Cleveland), Lumpkin County Commissioner's Office, Lumpnkin County Sheriff's Office, the Lumpkin County Board of Education Superintendent, Lumpkin County EMS, and the Dahlonega City Manager in writing a minimum of 30 calendar days in advance of the purposed detour date. SR 60 Business shall be reopened on at least 19 MM Superpave pavement course.

(District 1 Construction)

Submitted: April 5, 2021

LUMPKIN COUNTY

SPECIAL PROVISION

Project Name: SR 60 BUS & OAK GROVE ROAD ROUNDABOUT LUMPKIN COUNTY

Section 702—Vine, Shrub, and Tree Planting

702.1 General Description

This Work includes furnishing and planting vines, shrubs, trees and plants, treating regenerated areas, and environmental mitigation planting for riparian buffers and tidal marsh areas.

The Contractor shall provide a copy current certification as a Georgia Landscape Professional through the University of Georgia Center for Urban Agriculture prior to being approved to perform The Work.

702.1.01 Definitions

General Provisions 101 through 150.

702.1.02 Related References

A. Standard Specifications

Section 108—Prosecution and Progress

Section 214—Mitigation Site Construction

Section 700—Grassing

Section 882—Lime

Section 891—Fertilizers

Section 893—Miscellaneous Planting Materials

B. Referenced Documents

Standardized Plant Names

ANSI A300 Part 1 Pruning Standards

ANSI Z60.1 American Standards for Nursery Stock

702.1.03 Submittals

A. Certificates of Inspection

Submit certificates of inspection with the invoice for each shipment of plants as required by law for transportation.

File certificates with the Engineer before the material is accepted. Plants may be rejected at the site regardless of Federal or State government inspections at the place of growth.

B. Substitutions

When both primary and alternate plants are specified, use the alternate only after providing written proof that the primary plants specified are not available. In this case a Supplemental Agreement is not required to use the alternate plants.

When a primary or an alternate plant cannot be furnished, provide the Engineer written proof that neither is available. A Supplemental Agreement is required for substitute plants in this case.

Use approved substitute plants, as designated by the Engineer, equal in value to specified plants. Request substitutions at least thirty (30) days before the end of the planting season in the area.

702.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Water	700.2.B
Agricultural Lime	882.2.01
Fertilizers	891.2.01
Plant Topsoil	893.2.01
Landscape Mulch	893.2.02
Vines, Shrubs, Trees, and Miscellaneous Plants	893.2.03
Tree Paint	893.2.06
Prepared Plant Topsoil	893.2.07
Stakes	893.2.08
Organic Soil Additives	893.2.09

A. Plant Specifications

Furnish plants according to the plant name and Specifications included on the plan sheets..

1. Plant Names

   Ensure that the botanical and common names of plants specified conform with the most current edition of Standardized Plant Names, as adopted by the American Joint Committee on Horticultural Nomenclature.

2. Plants should be clearly labeled at the nursery. Labels should remain on the plants until inspected by the engineer.

3. Grades

   Ensure that plants meet the grade requirements of the most current American Nursery and Landscape Association ANSI Z60.1 and any other requirements.

   Caliper used for establishing plant grades or trunk sizes is measured according to the American Nursery and Landscape Association ANSI Z60.1. Plant trees with straight stems and symmetrical branches according to their natural growth. Trees with broken or damaged terminal or main stems will be rejected. There shall be a single dominant leader to the top of the all large canopy shade trees. There can be a double leader in the top 10% of the tree height.

   Trees should be rooting into the root ball so that soil or media remains intact and trunk and root ball move as one when lifted, but not root bound. The trunk should bend when gently pushed and should not be loose so it pivots at or below the soil line.

   There shall be no roots greater than 1/10 diameter of the trunk circling more than one-third the way around in the top half of the root ball. Roots larger than this may be cut provided they are smaller than one-third the trunk diameter.

   The leaf-bearing crown should be full and uniform. Leaves should show no evidence of chlorosis, necrosis, disease or insect infestation.

B. Bare root seedlings

Use nursery-grown bare root seedlings which are a minimum of three (3) feet (1 meter) in height above the ground with a 1/4 inch (6.35mm) caliper, and a minimum primary root length of five inches (5) unless specified differently on the plan drawings.

Use approved substitute plants, as designated by the Engineer, equal in value to specified plants. Request substitutions at least 30 calendar days before the end of the planting season in the area. Wet swale bare root *Juncus effuses* shall be fresh divisions with a full, dense root base.

C. Nursery Plants

Unless otherwise specified, use plants stock-grown in a licensed nursery under intensive care and cultivation for at least one year. The largest branches of shade trees should be spaced at least 6 inches apart. The branch system shall be normally developed and free of disease, injurious insects, disfiguring knots, sun-scald, injuries, bark abrasions, dead or dry wood, broken terminal growth, or other disfigurements. Stems should show no evidence of die-back. Ensure that proper certificates of inspection and a complete list of the nursery growers accompany nursery grown plants. See Subsection 893.2.03.

D. Approval and Selection of Materials and Work

Select materials and execute operations required under the Specifications and drawings with the approval of the Engineer. Remove rejected materials from the site promptly.

702.2.01 Delivery, Storage, and Handling

A. Bare-Rooted Plants

Protect bare root plants from drying out until planted. Uncovered roots without moisture-loss gel coating shall be exposed to air no longer than 15 minutes.

B. Balled and Burlapped Plants (B&B)

1. Burlap shall be a natural biodegradable material. Do not use synthetic burlap.
2. Replace plants rejected because of broken or loose balls, or balls of less diameter than that specified.
3. Protect the roots of balled and burlapped plants from moisture loss, unless they are planted immediately after they are delivered.
4. Plants shall be harvested with the ball of earth in which they are growing intact.

C. Container-Grown Plants

Keep container-grown plants moist but well drained until planted. Handle plants by the container or soil ball and not by the top growth.

D. Heeled-in Plants

Properly maintain heeled-in plants until they are planted. Do not allow plants to remain heeled-in over the summer or for over 30 days without the Engineer's consent.

E. Injury Prevention

Injured plants will be rejected. Protect tops of shrubs and trees while in transit to prevent windburn.

F. Live Willow Stake Material

Live stakes shall be moistened, capable of rooting, without injury and stripped of all stems and leaves with a minimum of scarring. The stakes shall be from 5 to 8 feet (1.5m to 2.4m) in length with a basal end of 0.5 to 1.5 inches (1.27cm to 3.8cm) in diameter. The top ends shall be blunt and cut square and the butt ends angled.

702.3 Construction Requirements

702.3.01 Personnel

General Provisions 101 through 150.

702.3.02 Equipment

General Provisions 101 through 150.

702.3.03 Preparation

A. Inspect Plant Material Before Digging

The Engineer will inspect trees or plants from the bidder's source for acceptability and conformity to specification requirements for approval by the Engineer. When rejecting the trees or plants, the Engineer reserves the right to pursue and examine other sources of plants to find acceptable specimens. This change will not constitute an increase in cost to the State.

B. Clear and Grub

Clear and grub the planting area before planting or beginning to prepare the plant bed, unless noted differently on the plans. See Section 201.

C. Prepare Plant Bed

Prepare for planting as follows:

1. Planting Limits

   Stake planting limits according to Plan details and the Engineer. Have the Engineer approve the method of plant identification before planting.

   For median plantings, keep any woody plant a minimum of 3 feet (1m) from the edge of the plant bed to avoid vegetative growth into the roadway.

   For stream buffers identified as "Stream Buffer" or "wet swales", on plans, the plant species shall be planted in a random, intermixed manner throughout the entire planting area. At the edges of the planting zone, keep new plants a minimum of 8 feet (2.4m) from existing trees or permanent structures.

2. Applications of Soil Additives
   a. Apply fertilizer and lime to the plant bed according to the soil test report.
   b. Spread an organic soil additive, (See Subsection 893.2.09), evenly throughout the designated area to at least 2 in (50 mm) deep. Thoroughly dig it into the soil to at least 6 in (150 mm) deep using a rotary hoe type tiller or other equipment that evenly mixes the soil, lime, fertilizer, and organic soil additive.
   c. Till the area until the surface is smooth and free of weeds, roots, rocks, and other debris, to the satisfaction of the Engineer.
   d. If the planting area lies within multitrophic native planting area, a stream buffer, wetland, wet swale, or marsh the addition of fertilizer or lime is prohibited.

702.3.04 Fabrication

General Provisions 101 through 150.

702.3.05 Construction

A. Seasonal Limitations for Planting

For geographic seasonal limitations, refer to the Planting Zones Map found in Subsection 700.3.05. Plant in Zones 1 and 2 between October 15 and March 15. Plant in Zones 3 and 4 between November 1 and January 1.

B. Planting Operations

Plant using the method called for on the details and plan sheets. Before beginning planting of each area, have available the necessary materials including prepared plant topsoil (see Subsection 893.2.07),

water, stakes, and mulch. Plants shall be installed as straight/upright as possible. Any plants found to be leaning or broken will not be accepted or paid for by the engineer.

When seasonal limitations and weather conditions permit, continuously water, mulch, guy, provide tree guards, and stake as indicated on the plans and details until completing the last operation.

After completing planting, provide a method for retaining water adjacent to the plant according to the details shown on the Plans or as directed by the Engineer.

Protect marsh restoration areas from vehicles and machinery. Typical protective barriers are not to be used in tidal areas. Stakes that remain secure and are taller than the highest tide, flagged with highly visible flagging tape, are required to mark the area to be protected and off-limits for vehicles and machinery.

1. Planting By the Pit Method
    a. Placing Bare-Rooted Plants

        Plant bare-rooted plants delivered to the pit area. Protect roots from drying out until placing them in the pit.

            1. Center plants in pits and spread roots as they originally grew.
            2. Cover and prepare the topsoil according to details shown on the Plans.

    b. Placing Balled and Burlapped Plants

        Immediately plant these plants after they are delivered to the pit site.

            1. The pit diameter shall be a minimum of 3 times the diameter of the rootball. Center the ball in the prepared pit, leaving the top of the ball 1 in (25 mm) above the top of the ground for settlement.
            2. Cut away and remove the top 1/3 of burlap from the rootball. Cut all ropes and twine, pull the nails, and drop the remaining burlap to the bottom of the hole. Cut away and remove all wire from the root ball.
            3. Partially fill the pit with prepared plant topsoil and compact the soil enough to hold the ball firmly. Add mycorrhizal innoculant to plant topsoil if specified in plans.

    c. Placing Container-Grown Plants

        When the container is delivered to the pit site, split the container from top to bottom and carefully remove the plant.

            1. The pit diameter shall be a minimum of 3 times the diameter of the rootball. Spread into the hole any major roots growing around the container or prune them to remove any circular growth.
            2. Place the ball in the center of the prepared pit, leaving the top of the ball 1 in (25 mm) above the top of the ground for settlement.
            3. Partially fill the pit with prepared plant topsoil and compact the soil enough to hold the ball firmly. Add mycorrhizal innoculant to plant topsoil if specified in plans.

    d. Completing Pit Plantings

        After placing pit plantings, water plants thoroughly the same day regardless of weather or soil moisture conditions.

            1. After the water has soaked in, add prepared plant topsoil and compact firmly up to 2 in (50mm) below the adjacent ground.
            2. Stop compacting when the compacted prepared topsoil is 2 in (50 mm) below the adjacent ground.
            3. Fill the remainder of each pit with loose, prepared plant topsoil according to the details shown on the Plans.
            4. Prepare the loose topsoil to retain water adjacent to the plant according to the Plans or as directed by the Engineer.

    e. Live Stake Plantings

1. Plant live willow stakes at four (4) ft (1.2m) intervals or as indicated on the drawings with the buds facing upward.
2. Eighty (80) percent of the stake shall be installed below ground, leaving twenty (20) percent extending above ground.
3. Stakes shall be placed deep enough to reach the water table during the dry season at an angle perpendicular to the slope.
4. Pack soil firmly around the hole after installation.
5. Install live willow (*Salix spp.)* stakes only in the dormant season, according to the planting details and landscape plan notes.
6. Replace any live stakes that split during installation.

2. Planting using a Dibble, Hoedad, or Reinforced Planting Shovel for Wet Swale and Bare Root Seedlings.

   Planting shall only be done when there is adequate moisture in the ground and when the ground is not frozen.

   Provide proper root positioning and contact with the soil, and eliminate all air pockets around roots. Roots of seedlings shall not be pinched or bent in a sideways or upturned direction.

   Each tree, division, or wet-swale plant shall be inserted into the hole such that the root collar of the tree will be at ground level after backfilling is complete. Allowance for burying the root collar below ground level shall not exceed one-half inch in depth. In no case shall planting result in the root collar remaining above ground level. The soil back-filled around the root system shall be compacted sufficiently to support the plant. Mow or use a string trimmer to a height of 1 in (25 mm) in the area designated for restoration. Do not trim wet swale or retention basins where standing water is present.

   Grass the area designated for restoration with a native restoration or riparian seed mix and apply wheat straw mulch to the area before planting seedlings.

   Plant within 48 hours after mowing or string trimming the site.

3. Restoration and enhancement of tidal marsh areas are subject to possible wave energy, requiring the use of a plant anchor for each plant. See planting plan sheets and details for plant anchor and anchoring descriptions.

C. Landscape Mulching

1. For Pit Plantings

   Follow these requirements when mulching for pit plantings:

   a. Where the distance between plants is 8 ft (2.4 m) or less, spread mulch throughout and 3 ft (900 mm) beyond the outermost plants. Where plants are more than 8 ft (2.4 m) apart, apply mulch in a circular fashion around each plant, forming a ring 5 ft (1.5 m) in the outside diameter.
   b. If plant pits are greater than 5 ft (1.5 m) in diameter, ensure that the mulch extends out to cover the berm as shown in the planting details on the Plans.
   c. Apply mulch within 3 days of planting at least 4 in (100 mm) in depth to obtain a compacted depth of at least 3 in (75 mm).
   d. Compaction occurs naturally. Check compaction at least two months after spreading and exposing the mulch to the elements.
   e. If the compacted depth is less than 3 in (75 mm), apply additional mulch to deficient areas within 1 month following notification.
   f. Apply mulch to a uniform depth and remove lumps for a neat appearance. Tuck mulch neatly against all paving edges, drainage structures, and where planting beds meet grassed areas.
   g. Leave a 1 in (25 mm) to 2 in (50 mm) ring of non-mulched area directly around all tree trunks.

h. Do not mulch with Cypress Mulch.

2. For Plantings using a Dibble, Hoedad, or Reinforced Shovel

   Apply landscape mulch according to Subsection 702.3.05.C.1 with the following exceptions:

   a. Apply mulch before planting.

   b. Use only wheat straw mulch in restoration areas.

   c. Ensure that the mulch coverage is open enough to allow seed germination to take place and dense enough to conserve moisture in the seed bed.

3. For Native Multitrophic or Stream Buffer Restoration Planting Areas wheat straw shall be the only types of mulch used.

4. Do not use mulch in a wet swale or tidal marsh area. Do not mulch wet swale or retention ponds where standing water is present.

D. Wrapping

Do not wrap the trucks of tree unless specified in the plans. When wrapping is specified, tightly wrap the trunks of deciduous trees over 1.25 in (32 mm) in caliper. Wrap in strip burlap or waterproof crepe tree wrapping paper or other approved materials.

1. Begin wrapping at the ground and extend spirally up and beyond the first rosette of branches with an overlap of one half the width of the wrapping material.

2. Tie the wrapping material securely with binder twine spaced every 12 in (300 mm) for the full length of the wrapping. Wrap immediately after planting.

E. Staking and Guying

1. Do not use staking and guying unless specified in the plans or details.

2. Perimeter Staking

3. Place perimeter stakes 2 in x 2 in x 36 in (50 mm x 50 mm x 900 mm). Stake the perimeter of indicated regenerated areas within specified planting dates according to the Plans or as directed by the Engineer. Keep staking for tidal marsh areas secured with supports taller than the highest tide with highly visible flagging tape to mark the area as off-limits for vehicles and machinery.

4. Vine, Shrub, and Miscellaneous Plant Staking

5. Use stakes to identify isolated vines, shrubs, and miscellaneous plants outside of solid mulched beds according to Plan details.

6. Tree Staking and Guying

7. Stake trees using a system that will prevent trees from leaning or tilting and keep the root ball stable until the roots become anchored. The system should allow the top some movement and flexibility without damaging the tree.

F. Pruning

1. Prune plants on the site before planting and after initial inspection by the Engineer as needed for the health of the plant. Never prune severely to get plants to meet Specifications.

   a. Follow ANSI A300 Part 1 standards and use approved tools designed for pruning.

   b. Lopping, topping, or shearing trees or shrubs is not permitted.

   c. Prune back damaged, scarred, frayed, split, and skinned branches, limbs, and roots to live wood nearest to the next sound, outside lateral bud, branch, limb, or root.

   d. Leave the terminal leaders or buds in trees intact.

   e. Prune roots, when necessary, as directed by the Engineer.

   f. Prune Crape Myrtles to maintain natural form only. Severely cutting back or stump pruning Crape Myrtles is not permitted. Remove sucker growth from Crape Myrtles.

   g. Damaged, scarred, frayed, split and skinned branches, limbs and roots shall be pruned back to live wood nearest to the next viable outside lateral bud, branch, limb or root.

G. Watering

1. Apply water in a manner to prevent erosion. Water plants deeply and thoroughly at the time of planting. Water after applying fertilizer called for in Subsection 702.3.05.H and as necessary to maintain enough moisture to promote plant growth. Use water reservoir bags if specified in plans or details.

    a. Apply enough water to wet the soil to a depth slightly below the roots. Direct the water to the ground around the plant, not the tops.

    b. Do not allow plant foliage to dry out or plants to defoliate from lack of water. Remove plants in such condition from the site immediately. Apply supplemental watering to maintain vigorous growth and to keep plants moist and as directed by the Engineer.

    c. Apply water once per week throughout the planting season in which the plants are installed. Follow Subsection 702.3.07.B and 702.3.07.C for shrub and tree watering requirements throughout the life of the project.

H. Spring Application of Fertilizer

1. Method and Rate of Application

    Follow these requirements when applying fertilizer in the spring:

    a. Trees

        Apply a slow-release fertilizer according to soil test results. Assume 8-12-12 with a rate of 1 cup (0.25 L) per caliper inch of tree for bidding purposes.

    b. Shrubs and vines

        Fertilize shrubs according to soil test results with a slow release fertilizer by spreading fertilizer around the base of the plant and working it into the soil by hand. Assume 6-12-12 with a rate of 0.5 cup (0.12 L) per foot of shrub height for bidding purposes.

        Bed Areas

        Spread fertilizer on bed areas (defined by method of planting in Subsection 702.3.05.B), over the mulch according to soil test results. Assume 3 lbs/100ft2 of 6-12-12 for bidding purposes. Thoroughly water in the plants.

    c. Native Restoration or Stream Buffer Areas

        The addition of fertilizer or lime is prohibited within the native restoration or stream buffer planting area.

    d. Tidal March Areas

        The addition of fertilizer or lime is prohibited within wet swales and marsh areas.

2. Time of Spring Fertilizer Application

    Apply fertilizer in the spring in Zones 1 and 2 (with reference to the Planting Zones specified in Subsection 702.3.05.A) between April 1 and April 15. Apply between March 15 and April 1 for Zones 3 and 4.

    For late plantings, do not apply fertilizer less than 30 days after the plantings.

3. Additional Fertilizer

    Approximately one month after the spring fertilizer is applied; the Engineer will inspect planted areas and determine if an additional application of fertilizer is needed for any plant or group of plants.

    If the Engineer determines additional fertilizer is required, apply fertilizer according to soil test results between June 15 and July 15th.

I. Tree Guards for Stream Buffer Saplings

Each planted bare root, sapling-sized plant shall be fitted with a tree guard to protect the saplings from wildlife browsing. The tree guards shall be at least 36 inches tall, with appropriately sized wooden stakes or bamboo to securely support the tree guard [i.e., a 4-foot (1.2 meter) stake for a 36 inch (914.4

mm)guard]. Mesh tube-type tree guards are required. Vexar tubes, or equivalent, are to be used. All tree guards shall be removed from the saplings at final inspection**.**

J. Restoration and Cleanup

Restore areas where existing grass has been damaged or scarred during planting operations at no expense to the Department. Restore the disturbed areas to their original conditions as directed by the Engineer. Clean up debris, spoil piles, and containers and leave the Project area clean.

Clean up and remove all debris, spoil piles, containers, water reservoirs, trash, etc. and leave the project area in an acceptable condition. Inspect all installed erosion control devices weekly and clean out or repair as required. Remove all erosion control devices at final acceptance unless otherwise instructed by the Engineer.

702.3.06 Quality Acceptance

Preserve the plants in a healthy growing condition and keep plants moist, particularly during drought conditions (no rain for any two week period). The acceptability of the plant material planted will be determined at the Final Inspection.

The plant establishment period is the period from the last planting specified in Subsection 702.3.05.B until the following October 1. Plant all plants in one planting season unless otherwise approved by Engineer.

A. Establishment Period

There are no establishment periods for this Project.

B. Final Inspection

The final inspection of the plants will be made when all Landscaping items are installed. The Contractor assumes responsibility for the plants until the Final Acceptance of the Project or a portion of the Project.

702.3.07 Contractor Warranty and Maintenance

Project maintenance includes, but is not limited to, watering, cultivating, weeding, pruning, repairing, adjusting guys and stakes, and performing other work as ordered by the Engineer until final acceptance.

Promptly remove from the Project area dead plants or those that no longer conform to the requirements of Subsection 702.2.A.2.

Mow the entire right-of-way within the limits of the Project up to a maximum of four times per calendar year. Do not mow native restoration areas, wet swales, or riparian mitigation sites.

A. Leaning Trees

Straighten leaning trees as directed by the Engineer. Follow Staking and Guying requirements for replacements or repairs as per Subsection 702.3.05.E.

B. Shrub Maintenance

1. Pruning

   Prune dead or diseased limbs to provide for plant health and appearance as directed by the Engineer.

2. Landscape Mulching

   Continuously maintain shrub and tree beds with a clean, freshly mulched appearance using the mulch originally specified. See Subsection 702.3.05.C. Do not mulch shrub and tree beds within riparian mitigation sites.

   a. Apply a 2 in (50 mm) loose layer of specified mulch (top-dressing) on top of all areas, including tree pits, initially mulched, at the following times:

      1. By October 31, 2022, initial application.

3. Applying Fertilizer

   See Subsection 702.3.05.H.

4. Applying Pesticides
    a. Inspect all planted or seeded vegetation for insects, grubs, mites, diseases, etc., once every two weeks. Apply insecticides, fungicides, and herbicides according to the manufacturer's recommendations to effectively control or eradicate the problem.
    b. Perform all pesticide applications under the direct supervision of a trained licensed commercial pesticide operator whose license includes subcategory 27 – Right of Way Pest Control. Carry the pesticide license/certification on the work site during applications. Carry all labeling associated with the chemical being applied at the work site.
    c. Submit all product information data sheets and EPA approval numbers on all pesticides proposed to be used prior to application for approval.
    d. Notify the Engineer a minimum of 48 hours prior to any and all pesticide applications.
    e. Add a blue dye to all spray applications unless approved otherwise by the Engineer.
    f. Monitor the weather and spray under proper weather conditions. Spraying shall not occur when the weather is greater than 10 miles per hour.
    g. Wear the proper safety attire. Wear long sleeve shirts, long pants, gloves, and safety glasses. Wear or use any additional protective safety attire or gear as recommended by the product's manufacturer.
    h. Repair any damage that is a result of mishandling or misuse of materials, at no expense to the Department, to the satisfaction of the Engineer.
    i. For stream buffer and marsh restoration areas, pesticides are not to be used unless approved by the Department Ecology Manager.
5. Edging
    a. Edge all shrub pits, shrub beds, and tree pits once a month throughout the life of the project such that the vee-cut edging detail specified on the plans is maintained. Prevent grass and weeds from growing over or into the shrub beds and tree pits.
    b. Use equipment specifically designed for edging. Line trimming equipment shall not be used.
6. Watering
    a. Check all planted material once a week throughout the contract for dryness by removing the mulch from their base and "sampling the soil" approximately 4 in (100mm) deep. Water if the soil is not moist.
    b. Water all planted material if a drought (no rain for two weeks) occurs. Provide the water required to meet the watering requirements.
    c. Water each plant thoroughly until the ground is saturated to a depth slightly below the root ball. Apply water in a manner to prevent erosion.
7. Weed Control

    Perform weed control throughout the project, a minimum of once every two weeks, in all areas within the project limits to maintain tree pits, shrub beds, sidewalks, curb and gutter, walkways, ditch paving, concrete medians, and other pavement weed free. Meet the following conditions:
    a. Perform weed control to prevent weeds from becoming established, setting seed, or from becoming visible in the planting beds.
    b. Completely remove all undesirable plants (weeds) by hand pulling. Removal of weeds may be accomplished using herbicides if approved by the Engineer. However, the use of herbicides is prohibited in stream buffer areas unless approved by the Department Ecology Manager.
    c. Apply an approved pre-emergent herbicide twice each year, once in the spring and once in the fall, throughout the contract. The use of pre-emergent herbicides is prohibited in stream buffer areas. Apply pre-emergent to all shrub beds and tree pits. Notify the Engineer 48 hours prior to spraying. Use a blue dye in all applications unless approved otherwise by the Engineer.

d. Eradicate all invasive exotic pest plants found within the project limits throughout the life of the project, including stream buffer and marsh areas. Volunteer, non-invasive plant material within stream buffer restoration areas is acceptable.

e. Dispose off site on a daily basis all weed, exotic plants, clippings, litter, and debris generated.

8. Policing

   Remove debris such as paper, broken limbs, bottles, cans, etc., a minimum of the first and third week of each month from all areas within the project limits while maintaining the site.

9. Mitigation Areas

   Pruning, mulching, edging, and applying spring fertilizer are not required within wet swales, native restoration areas, stream buffers. Wets swales and regenerated forest areas.

C. Tree Maintenance

1. Watering

   See Subsection 702.3.07.B.6.

2. Landscape Mulch

   See Subsection 702.3.07.B.2.

3. Fertilizer

   See Subsection 702.3.05.H.

4. Abnormal Conditions

   Periodically (once every two weeks) observe trees and shrubs for abnormal conditions such as insects, borers, web worms, red spiders, etc., and immediately treat.

5. Sucker Growth

   Remove sucker growth once a month. Sucker growth is the shoots that sprout out around the base of the tree trunk.

6. Pruning and Deadwood

   Remove deadwood at least two times a year. Prune dead branches. Paint cuts, and wounds or scars with tree paint only when specified in the plans. Do not top Crape Mrytles. See Subsection 702.3.05.F.

7. Pesticide Control

Apply pesticides as necessary to control harmful insects and diseases. Follow the manufacturer's instructions. . See Subsection 702.3.07.B.4. NOTE: Use chemicals according to Federal, State and county directives on environmental control that carry an EPA approval number.

8. Weed Control

   See Subsection 702.3.07.B.

9. Staking and Guying

   Remove all support guy wires, strapping and stakes from plants which have gone through one complete growing season.

702.4 Measurement

A. Plants

Plants of the name and size specified are measured for payment according to the number planted at the Final Inspection.

B. Fertilizer

Spring application fertilizer applied to planted and regenerated areas will be the actual number of pounds (kilograms) placed and accepted. Fertilizer, lime, and plant topsoil used in prepared plant

topsoil or plant bed preparation are not measured for separate payment. For stream buffer and marsh areas, the addition of fertilizer or lime is prohibited.

C. Perimeter Stakes

Perimeter stakes is not measured for payment unless such item is shown as a separate Pay Item in the Proposal.

D. Clearing and Grubbing

Clearing and grubbing is not measured for payment unless the Item is shown as a separate Pay Item in the Proposal.

E. Landscape Mulch

The quantity of landscape mulch and top-dressing measured for payment will be the actual number of square yards (meters) completed as specified and accepted. The presence of weeds or other growth, or foreign material, will be cause for rejection.

702.4.01 Limits

General Provisions 101 through 150.

702.5 Payment

A. Plants

Plants measured for payment will be paid for as follows:

1. After planting satisfactorily, the Department will pay 100 percent of the Contract Unit Price bid per each on the next estimate.

B. Fertilizer

All grades of fertilizer applied in the spring, measured as specified above, are paid for at the Contract Price per pound (kilogram) or per ton (megagram), whichever is indicated in the Proposal. Payment is full compensation for furnishing and applying and for watering regenerated areas.

For native restoration, stream buffer and marsh restoration areas, the addition of fertilizer or lime is prohibited.

C. Perimeter Stakes

Perimeter stakes will not be measured for payment. The cost will be included in the overall contract price.

D. Landscape Mulch

Landscape mulch measured for payment will be paid for as follows:

1. After mulching satisfactorily completing mulch (initial application) by October 31, 2022, the Department will pay 100% of the Contract Unit Price bid per square yard (meter).
2. Do not mulch marsh restoration areas.
3. Do not apply additional applications of mulch after the initial application in stream buffer restoration areas.

Payment will be made under:

Item No. 702	Plant name and size	Per each
Item No. 702	Fertilizer, spring application	Per ton (megagram)
Item No. 702	Landscape Mulch	Per square yard (meter)
Item No. 702	Spring application fertilizer	Per pound (kilogram)
Item No. 702	Live Stakes and Plantings	Per each
Item No. 702	Perimeter Stakes	Per each

Item No. 700	Agricultural Lime	Per ton (megagram)
Item No. 702	Bare Root Seedlings Plantings	Per each
Item No. 702	Riparian Seeding	Per acre

702.5.01 Adjustments

General Provisions 101 through 150.

LUMPKIN COUNTY

SUPPLEMENTAL SPECIFICATION

Section 713—Organic and Synthetic Material Fiber Blankets

Delete Section 713 and Substitute the following:

713.1 General Description

This work includes furnishing and placing straw, excelsior, coconut fiber, wood fiber, or synthetic blankets over previously prepared and permanently grassed areas as shown on the Plans or as directed by the Engineer.

713.1.01 Definitions

- Straw Blanket: A machine-produced blanket of clean, weed-free, consistently thick straw from agricultural crops. The straw is evenly distributed over the entire area of the blanket.
- Excelsior Blanket: A machine-produced mat of curled wood excelsior. Eighty percent consists of 6 in (150 mm) or longer fiber evenly distributed over the entire blanket.
- Coconut Fiber Blanket: A machine-produced blanket of 100 percent coconut fiber evenly distributed over the entire blanket.
- Wood Fiber Blanket:

  Type I—A machine-produced blanket manufactured with reprocessed wood fibers to a consistent thickness.

  Type II—A hydraulically applied bonded fiber matrix which upon drying, adheres to the soil in the form of a continuous 100 percent coverage, biodegradable erosion control blanket
- Synthetic Fiber Blanket—A machine produced uniform blanket of ultraviolet degradable polypropylene staple fibers reinforced with ultraviolet degradable polypropylene netting.

713.1.02 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

General Provisions 101 through 150.

713.1.03 Submittals

Use approved materials from QPL 62 without further testing. Otherwise, submit materials for testing before use.

713.2 Materials

Use blankets that meet the following requirements for placement on both slopes and waterways, except where noted below. For a list of organic material fiber blankets, see QPL 62.

A. Straw Blanket

Use blankets at least 48 in (1.2 m) wide and at least 3/8 in (9 mm) thick with a minimum dry weight of 0.5 lb/yd² (270 g/m²) and a stitch pattern and row spacing of no more than 2 in (50 mm). Have the top side covered with a photo-degradable plastic mesh having a maximum mesh size of 1/2 by 1/2 in (25 mm by 25 mm). The mesh will be sewn to the straw with biodegradable thread.

Use this blanket on slopes only.

B. Excelsior Blanket

Use a smolder-resistant blanket with the top side clearly marked. Use a blanket at least 48 in (1.2 m) wide and 1/4 in (6 mm) thick with a minimum dry weight of 0.8 lb/yd² (430 g/m²) and a stitch pattern and row spacing of no more than 2 in (50 mm).

- Slopes: Have the top side covered with a photo-degradable plastic mesh having a maximum mesh size of 1-1/2 by 3 in (38 by 75 mm).
- Waterways: Have the top and bottom sides of the blanket covered with a photodegradable plastic mesh having a maximum mesh size of 1 ½ x 3 in (38 x 75 mm), sewn to the fiber with biodegradable thread or otherwise bonded as approved by the Engineer.

C. Coconut Fiber Blanket

Use a blanket at least 48 in (1.2 m) wide and 1/4 in (6 mm) thick with a minimum dry weight of 0.5 lb/yd² (270 g/m²) and a stitch pattern and row spacing of no more than 2 in (50 mm).

Ensure that both sides of the blanket are covered with a photo-degradable plastic mesh with a maximum of 5/8 by 5/8 in (19 by 19 mm). Have the mesh sewn to the fiber with a breakdown-resistant synthetic yarn.

D. Wood Fiber Blanket

Type I

- Use a machine produced blanket manufactured to a consistent thickness using reprocessed wood fibers.
- Use a blanket at least 48 in (1.2 m) wide with a minimum dry weight of 0.35 lb/yd². (190 g/m²). Use the blanket on slopes only.
- Ensure that the top side of the blanket is covered with a photo-degradable plastic mesh with a maximum mesh size of 5/8 by 3/4 in (16 by 19 mm) securely bonded to the mat.
- Ensure that the fibers do not contain a growth that inhibits germination.

Type II

- Ensure the bonded fiber matrix is composed of long strand wood fibers or cellulosic-based fibers held together by a bonding agent, which, upon drying, becomes insoluble and non-dispersible.
- Apply the matrix at the following rates:

Application Rate	Slope
3,000 lbs/acre (3.4 Mg/ha)	4:1
3,600 lbs./acre (4.1 Mg/ha)	2:1
4,000 lbs./ acre (4.5 Mg/ha	1:1

- Do not apply the bonded matrix on saturated soils or immediately before, during or after rainfall. Allow the matrix to dry for at least 24 hours after installation. After drying period, ensure that the bonded fiber matrix does not inhibit the germination or growth of plants beneath and through the formed matrix blanket and that it does not form a water insensitive crust.
- If bonded fiber matrix is to be used, the application of straw mulch for grassing operations is not required.

E. Synthetic Fiber Blanket

Use a blanket having a minimum net size of 5/8 x 3/4 inch (16 x 19 mm). Ensure the netting is securely bonded to the blanket and that the blanket conforms to the following physical properties:

PROPERTY	MINIMUM VALUE	TEST METHOD
Weight	1 oz/sq. yd (34 g/m^2)	
Roll Width	48 inch (1.2 m)	

Tensile Strength Length	6 lbs./in	ASTM D 1682 [6” (150 mm) strip)]

Use Synthetic fiber blanket on slopes only.

F. Anchoring Staples

Use anchoring staples made from minimum 11-gauge wire, formed into a U shape. The legs will be at least 6 in (150 mm) long and the crown at least 1 in (25 mm) wide. Use staples rigid enough to penetrate the soil without distortion.

713.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

713.3 Construction Requirements

713.3.01 Personnel

General Provisions 101 through 150.

713.3.02 Equipment

General Provisions 101 through 150.

713.3.03 Preparation

Before placing the blanket, complete the grassing operations, smooth the area, and remove stones, lumps, roots, or other material that would prevent the blanket from laying snugly on the soil.

713.3.04 Fabrication

General Provisions 101 through 150.

713.3.05 Construction

A. Placing Blanket

Place blankets or mats vertically on slopes, beginning at the top of the slope and extending to the bottom of the slope. Horizontal installation of the blankets is not permitted.

Place the blanket within 24 hours after planting and before rain or watering. Place the blanket on slopes and waterways as follows:

1. On Slopes

   Unroll the blanket with the netting on top and the fibers contacting the soil over the entire slope. When using two or more blankets to cover an area, overlay the joint 4 in (100 mm) and staple through the joint. Overlap the ends of the blanket at least 6 in (150 mm) with the upgrade section on top and staple through the overlap.

2. In Waterways

   In waterways, ditches, flumes, and channels unroll the blanket with netting sewn on both sides and place in contact with the soil beginning at the downstream terminal and progressing upstream of the blanket according to the Construction Detail for Permanent Soil Reinforcing Mat.

   Allow a longitudinal seam only if the blankets overlap at least 6 in (150 mm) and are securely stapled. Overlap ends of the blanket at least 6 in (150 mm) with the upgrade section on top.

   Insert 12 in (300 mm) of the upslope end of the first row of blankets into a 6 in (150 mm) deep anchor slot. Staple the blanket in the slot bottom, backfill the slot, and solidly tamp.

B. Stapling

Drive staples vertically into the ground to anchor the plastic mesh. Place the staples approximately 2 yd (2 m) apart on each side of the blanket and add one row in the center alternately spaced between each side staple.

Where blankets lay side to side, place each staple so that half of the staple anchors mesh from each blanket.

At the beginning of a blanket, space staples approximately 12 in (300 mm) apart in a row.

C. Steep Slopes

The Engineer may specify additional staples or check slots in waterways where slopes are steep or large water volumes and/or velocities are anticipated.

713.3.06 Quality Acceptance

General Provisions 101 through 150.

713.3.07 Contractor Warranty and Maintenance

Maintain the blanket installation throughout the life of the Contract. If before Final Acceptance any staples become loose or lift up or if the blanket becomes loose, torn, or undermined, then fix the problem by reshaping, regrassing, refertilizing, or replacing damaged areas. Repairs are done without additional compensation.

713.4 Measurement

Straw blanket excelsior blanket, coconut fiber blanket, wood fiber blanket, or synthetic blanket, installed and accepted is measured for payment by the square yard (meter). Laps and blanket in the anchor slots are not measured. They are considered incidental to the work.

713.4.01 Limits

General Provisions 101 through 150.

713.5 Payment

The preliminary preparation of the areas on which the blanket is to be placed, including seeding or sodding, will be paid for under the appropriate Contract Items.

Straw blanket excelsior blanket, coconut fiber blanket, wood fiber blanket or synthetic fiber blanket will be paid for at the Contract Unit Price per square yard (meter). Payment is full compensation for the construction of the Item including all laps, materials, equipment, tools, labor, incidentals, and maintenance.

Payment will be made under:

Item No. 713	Straw blanket (slopes)	Per square yard (meter)
Item No. 713	Excelsior blanket (slopes)	Per square yard (meter)
Item No. 713	Excelsior blanket (waterways)	Per square yard (meter)
Item No. 713	Coconut fiber blanket (slopes)	Per square yard (meter)
Item No. 713	Coconut fiber blanket (waterways)	Per square yard (meter)
Item No. 713	Wood fiber blanket (slopes)	Per square yard (meter)
Item No. 713	Synthetic fiber blanket (slopes)	Per square yard (meter)

713.5.01 Adjustments

General Provisions 101 through 150.

LUMPKIN COUNTY

SPECIAL PROVISION

Section 812—Backfill Materials

Replace Section 812 with the following:

812.1 General Description

This section includes the requirements for material used as backfill: foundation backfill, Pipe, Types I and II, imperfect trench backfill, Type III, and mechanically stabilized embankment backfill.

812.1.01 Related References

A. Standard Specifications

Section 810—Roadway Materials

Section 800 – Coarse Aggregates

B. Referenced Documents

AASHTO T 11

AASHTO T 21

AASHTO T 27

AASHTO T 96

AASHTO T 104

AASHTO T-267

AASHTO T-288

AASHTO T-289

ASTM C295

ASTM D4327

GDT 4

GDT 6

GDT 7

GDT 24a

GDT 24b

GDT 63

GDT 67

GDT 75

SOP 1

812.2 Materials

812.2.01 Foundation Backfill, Type I

A. Requirements

1. Use natural or artificial mixtures of materials consisting of hard, durable particles of sand or stone, mixed with silt, clay and/or humus material for Type I backfill.
2. Have the final blend of material meet the requirements of Class I or II soils in Subsection 810.2.01.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Soil gradation	GDT 4
Volume change	GDT 6
Maximum density	GDT 7 or GDT 67

D. Materials Warranty

General Provisions 101 through 150.

812.2.02 Foundation Backfill, Type II

A. Requirements

1. Type

   Use material meeting the requirements of Section 800, Class A or B aggregate, and SOP 1. Crushed concrete may be used provided it meets the requirements of Section 800 that are applicable to Group 2 Aggregates.

   Do not use backfill aggregate containing soil or decomposed rock.

2. Gradation

   Use material meeting the following gradation requirements:

Sieve Size	% Passing by Weight
1-1/2 in (37.5 mm)	100
1 in (25 mm)	80-100
No. 8 (2.36 mm)	0-5

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Sieve analysis	AASHTO T 27

D. Materials Warranty

General Provisions 101 through 150.

812.2.03 Imperfect Trench Backfill, Type III

A. Requirements

1. Type

   Use material made from either of the following for Type III backfill:

   - A natural soil with a density of less than 95 lb/ft³ (1520 kg/m³) when tested with GDT 7
   - An artificial mixture of soil and organic material, such as hay, leaves, or straw

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The laboratory will:

1. Test the soil density with GDT 7.
2. Review the mixture and the percentages of each material, and approve a mixture suitable for the Project.

D. Materials Warranty

General Provisions 101 through 150.

812.2.04 Mechanically Stabilized Embankment Backfill

A. Requirements

Use material comprised of crushed stone, natural sand, or a blend of crushed stone and natural sand from sources listed on Qualified Products Lists 1 and 2, or approved by the Office of Materials and Testing. Ensure material is within the following limits for soils, organics or any other deleterious substances meeting the following additional requirements:

NOTE: Deleterious substances include but are not limited to: wood, brick, asphalt, shale recycled concrete, construction waste and shall meet the following limits:

Substance	Maximum Percent by Weight
Sand Equivalent Group 1	≥ 20
Sand Equivalent Group 2	≥ 28
Any combination of Brick, Shale, Asphaltic Concrete, Recycled Concrete, Weathered Rock, Construction Waste, Soil or Wood	2

1. Crushed Stone

   Use a material manufactured from Class A or B stone that meets the requirements of Section 812.2.04.A, has a soundness loss of not more than 15 percent, and conforms to the stockpile requirements of SOP 1.

2. Natural Sand

   May be used in conjunction with an approved, non-corrodible, extensible reinforcement. Use non-plastic material consisting of strong, hard, durable particles having a durability index of at least 70 and meeting for class IIB3 or better in accordance with section 810.2.01.A.1. Use Natural Sand from an approved source on Qualified Products List – 1 or from a source approved by the Office of Materials and Testing. Requirements for approval will be provided by the Technical Assistance Bureau.

3. Gradation

Sieve Size	% Passing by Weight
4 in (100 mm)	100
2 in (50 mm)	80 -100
No. 10 (2 mm)	20 - 90*
No 200 (75 μm)	0 - 15
* Natural Sand may be 20 - 100	

4. Chemical

   Ensure the material meets the following chemical requirements:

Test Method	Requirement
pH	*5.0 – 9.5
Resistivity	>3000 ohms/–cm
Chlorides	<100 ppm
Sulfates	<200 ppm
Note: These chemical requirements are not applicable to MSE walls stabilized with an approved, non-corrodible, extensible reinforcement.	

*Sources of select backfill material having a pH between 4.5 and 5.0 may be used provided the interior face of the MSE wall panels have 3 inches of concrete cover over the reinforcement.

5. Maximum Dry Density

   Use backfill material with a maximum dry density equal to or greater than the design unit weight shown on the plans.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test the material as follows:

Test Method	Requirement
Percent Wear	AASHTO T96 (“A” Grading)
Sieve Analysis	AASHTO T 27
Material Passing No. 200 (75 μm) Sieve	AASHTO T 11

Organic Impurities	AASHTO T 21
Durability Index	GDT 75
Sand Equivalent	GDT 63
Volume Change	GDT 6
Petrographic Analysis	ASTM C295
Maximum Dry Density	GDT 7 or GDT 24a, GDT 24b
Soundness (Magnesium Sulfate)	AASHTO T 104
Determining Minimum Laboratory Soil Resistivity	AASHTO T-288
Determining pH of Soil for Use in Corrosion Testing	AASHTO T-289
Chlorides	ASTM D4327
Sulfates	ASTM D4327
Organic Content	AASHTO T-267

Office of Materials and Testing

DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

SPECIAL PROVISION

Section 815—Graded Aggregate

Delete Section 815 and substitute the following:

815.1 General Description

This section includes the requirements for material to be used for base, subbase, or shoulder course material, and includes graded aggregate, unconsolidated limerock base, and recycled concrete base.

815.1.01 Related References

A. Standard Specifications

Section 800—Coarse Aggregate

B. Referenced Documents

AASHTO T 11

AASHTO T 27

AASHTO T 193

ASTM C 295

ASTM D 3042

FL DOT Method FM5-515

SOP–1

QPL-2

GDT 63

EPA Method 3050/6010

EPA Method 1311

EPA Polarized Light Microscopy Method

EPA Transmission Electron Microscopy Method

815.2 Materials

815.2.01 Graded Aggregate

A. Requirements

1. Type

   Use graded aggregate base, subbase, or shoulder course material of uniform quality.

   a. Obtain the graded aggregate from an approved source or deposit that will yield a satisfactory mixture meeting all requirements of this Specification.

   b. Use material that is crushed or processed as a part of the mining operations, or, mix two grades of material so that when combined in the central mix plant, the mixture meets the specifications.

c. May use material that is a blend of not more than 20 percent (max) recycled crushed concrete from known sources (see 815.2.03.A.1.a) and virgin aggregate if approved by the Office of Materials and Testing.

2. Retained on the No. 10 (2 mm) sieve

   Ensure the material retained on the No. 10 (2 mm) sieve is Class A or B aggregate that meets the requirements of Section 800.

3. Passing the No. 10 (2 mm) sieve

   Ensure material passing the No. 10 (2 mm) sieve is relatively free of detrimental substances, such as soil overburden, decomposed rock, and/or swelling silts.

4. Stabilized Mixtures

   Ensure mixtures to be stabilized react satisfactorily when mixed with Portland cement. The Engineer will specify the percentage of Portland cement to use.

5. Gradation

   Grade the graded aggregate base, subbase, or shoulder material as follows:

Sieve Size	Percent Passing By Weight
Group I Aggregates	
2 in (50 mm)	100
1-1/2 in (37.5 mm)	95-100
3/4 in (19.0 mm)	60-95
No. 10 (2 mm)	25-50 (Note 1, 2 and 3)
No. 60 (250 µm)	10-35
No. 200 (75 µm)	7-15
Group II Aggregates	
2 in (50 mm)	100
1-1/2 in (37.5 mm)	95-100
3/4 in (19 mm)	60-90
No. 10 (2 mm)	25-45 (Note 2 and 4)
No. 60 (250 µm)	5-30
No. 200 (75 µm)	4-11
NOTE 1: Group I aggregates having less than 37% passing the No. 10 (2 mm) sieve, shall have at least 9 percent passing the No. 200 (75 µm) sieve.	
NOTE 2: For graded aggregate stabilized with Portland Cement, 30-50 percent by weight shall pass the No. 10 (2 mm) sieve. All other requirements remain the same.	
NOTE 3: Material passing the No. 10 (2 mm) sieve shall have a sand equivalent of at least 20 for Group I aggregates.	
NOTE 4: Material passing the No. 10 (2 mm) sieve shall have a sand equivalent of at least 28 for Group II aggregates. Sand Equivalent values as low as 20 will be acceptable provided they are attributed exclusively to rock flour and the percent passing the No. 10 (2 mm) sieve does not exceed 40.	

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method

Material that passes a No. 200 (75µm) sieve	AASHTO T 11
Gradation	AASHTO T 27
Sand Equivalent	GDT 63

D. Materials Warranty

General Provisions 101 through 150.

815.2.02 Unconsolidated Limerock Base

A. Requirements

1. Type

   Use limerock base, subbase, or shoulder course material of uniform quality.

   a. To ensure uniform quality, the Department may restrict approved sources to specific mining areas, mining processes at a specific mining site, or both.

   b. Use a limerock base that yields a mixture to meet these Specifications.

   c. Use material that is crushed or processed as a part of the mining operations, or mix two grades of material so that when combined in the central mix plant the mixture meets the specifications.

   d. Use limerock base, subbase, or shoulder material that has the following characteristics:

Limerock bearing ratio	At least 100.
Deleterious substances	Do not allow chert or other extremely hard pieces that will not pass the 2 in (50 mm) sieve. Do not allow clay, sand, organics, or other materials in quantities that may damage bonding, finishing, or strength. All material passing the No. 40 (425 µm) sieve shall be non-plastic.
Carbonate content (magnesium or calcium)	At least 80%.

2. Gradation

   Grade the limerock base so at least 97 percent by weight passes the 3-1/2 in (90 mm) sieve.

   a. Grade the material uniformly to dust. The fine portion passing the No. 10 (2 mm) sieve shall all be dust of fracture.

   b. Crush or break the limerock base, if necessary to meet size requirements before placing the material on the road.

   c. Ensure materials having soundness losses of 20% or less, comply with the following gradation requirements:

Gradation Requirements

Sieve Size	Percent Passing By Weight
2” (50 mm)	100
1-1/2” (37.5 mm)	95-100
3/4” (19 mm)	60-95
No. 10 (2.00 mm)	25-45
No. 60 (250 µm)	10-30
No. 200 (75 µm)	7-20

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Material that passes a No. 200 (75µm) sieve	AASHTO T 11
Gradation	AASHTO T 27
Limerock bearing ratio	FL DOT Method FM5-515
Petrographic analysis	ASTM C 295
Total carbonates (insoluble residue)	ASTM D 3042

D. Materials Warranty

General Provisions 101 through 150.

815.2.03 Recycled Concrete Base

A. Requirements

1. Sources

   Use recycled concrete materials from sources approved by the Office of Materials and Testing and listed on Qualified Products List 2. The criteria for approval will be as outlined in Standard Operating Procedure No. 1, "Monitoring the Quality of Coarse and Fine Aggregates" except the raw material will be recyclable concrete as specified herein rather than a geological deposit of aggregate.

2. Type

   a. Recycled Concrete Base From Known Sources

   Use recycled concrete derived exclusively from Portland cement concrete pavement or structural concrete as a base, subbase, or shoulder course.

   b. Recycled Concrete Base From Unknown Sources

   Use recycled concrete derived from sources of demolition materials that comply with the following requirements as a base, subbase or shoulder course. Due to the condition and type of raw material used to produce this base and the resulting difficulty in producing a consistent product, refer to SOP-1 for environmental requirements and preferred production procedures.

   Ensure the finished product does not exceed the regulatory limit for asbestos of 1% (based on microscopy) and the regulatory limit for lead of 5 ppm. These determinations must be made prior to shipping.

   Ensure the California Bearing Ratio (CBR) of the finished product is not less than 140.

3. Gradation and Load-Bearing Capacity

   Ensure the finished product meets the quality and gradation requirements of Subsection 815.2.01for Group II aggregates, except the material finer than a #200 (75µm) sieve shall be 2 – 11%.

   Ensure the California Bearing Ratio (CBR) of the finished product is not less than 140.

~~4.~~ Contaminants

   Ensure the recycled concrete is substantially free of foreign materials such as steel reinforcement, wood, clay balls, soils, epoxy expansion material and non-construction materials.

   Note – Substantially free, in the context of this specification, shall mean concentrations of the above mentioned foreign materials individually shall not exceed 0.1 percent by weight, nor shall the total concentration of these materials exceed 0.5 percent by weight.

Ensure the finished product does not exceed the regulatory limit for asbestos of 1% (based on microscopy) and the regulatory limit for lead of 5 ppm.

Keep the following ancillary materials within these limits:

Substance	Maximum Percent by Weight
Brick	2
Asphaltic Concrete	5
Weathered Rock	2
Any combination of Brick, Asphaltic Concrete or Weathered Rock	7

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Gradation	AASHTO T 27
Material that passes a #200 (75µm) sieve	AASHTO T 11
Sand Equivalent	GDT 63
California Bearing Ratio (CBR)	AASHTO T 193
Petrographic Analysis	ASTM C 295
Total Lead	EPA Method 3050/6010
Toxicity Characteristic Leaching Procedure	EPA Method 1311
Asbestos	EPA Polarized Light Microscopy Method Or EPA Transmission Electron Microscopy Method

D. Materials Warranty

General Provisions 101 through 150.

DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

SUPPLEMENTAL SPECIFICATION

Section 820—Asphalt Cement

Delete Section 820 and substitute the following:

820.1 General Description

This section includes the requirements for asphalt cements prepared from crude petroleum.

820.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

Standard Operating Procedure (SOP 4)

AASHTO R 28

AASHTO T 48

AASHTO T 179

AASHTO T 240

AASHTO T 313

AASHTO T 314

AASHTO T 315

AASHTO T 316

AASHTO T 350

C. Definitions

Performance Grade (PG): Method of classifying an asphalt cement binder relative to its rated performance at different testing temperatures.

Polymer Modified Asphalt (PMA): Engineered asphalt cement which incorporates Styrene-Butadiene-Styrene (SBS) or Styrene-Butadiene (SB) polymers.

Highly Modified Polymer Asphalt (PG 76-22E): Engineered asphalt cement which incorporates significantly higher levels of Styrene-Butadiene-Styrene (SBS) or Styrene-Butadiene (SB) polymers than PMA.

Asphalt Rubber Binders (ARB): Engineered asphalt cement which incorporates Styrene Butadiene Rubber (SBR) or Ground Tire Rubber (GTR). The GTR may be incorporated into the asphaltic concrete mixture via a dry method when approved by the Office of Materials and Testing.

Hot Applied Non-tracking Bituminous Tack: A non-tracking engineered asphalt cement based bituminous tack coat material that is applied using a conventional heated distributor.

820.2 Materials

820.2.01 Asphalt Cement

A. Requirements

1. Type

Use a homogenous, free from water and deleterious material that will not foam when heated to 347 °F (175 °C).

Ensure blend used to produce a specified performance grade meets the following requirements:

- Is uniform and homogeneous without separation
- Uses PG 64-22 or PG 67-22 described below for the base asphalt
- Consists of production materials not being "air-blown".
- Contains < 0.5% acid (Polyphosphoric Acid (PPA) modification, for PG 76-22 PMA, 76-22E and PG76-22 ARB only, when approved by the Office of Materials.
- Only additives or modifiers approved by the Office of Materials and Testing are used.

2. Grade

Use the various grades of asphalt cement meeting the requirements shown in the test requirements for Petroleum Asphalt Cements.

a. Add SBS or SB to neat asphalt to produce a binder meeting requirements for PG 76-22 PMA and PG 76-22E when roadway ADT is equal to or greater than 100,000 vpd for Stone Matrix Asphalt (SMA) and Porous European Mix (PEM) or Open Graded Friction Course (OGFC) Mixtures.

b. SBR or GTR modified PG 76-22 ARB is an acceptable alternative to SBS or SB modified asphalt cement at the contractor's discretion, when roadway ADT is less than 100,000 vpd, provided the SBR or GTR modified asphalt cement meets the tests' requirements specified in Table 7.

For SBR modified PG 64-22 or PG 67-22 to meet PG 76-22 ARB, use only SBR currently approved on QPL-65 "Georgia's List of Approved Latex Suppliers". For GTR modified PG 64-22 or PG 67-22 to meet PG 76-22 ARB, use 30 mesh size ambient or cryogenic ground tire rubber at minimum 10% of weight of neat asphalt cement content of the asphaltic concrete mixture. Ensure Trans-Polyoctenamer is added at 4.5% of the weight of the crumb rubber to achieve better particle distribution. Other approved workability additives may be used, at the discretion of the Office of Materials, provided the end product meets all specified requirements of PG76-22 ARB. Ensure the end product is homogenous and shows no separation or coagulation. Percentage of ambient or cryogenic ground tire rubber is neat asphalt source dependent and may require > 10 % to meet specification requirements for PG 76-22 ABR.

Superpave PG Binder Table 1 – Hot Applied Non-tracking Bituminous Tack

Test and Method	Test Temperature	Specification	Notes
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 3.0 Pa·s	a
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	147 °F (64 °C)	Minimum 1.00 kPa	
Test on Residue from Distillation Test: Penetration, 77 ºF (25 °C), 100 g, 5 sec., (dmm) AASHTO T49	77 °F (25 °C)	Maximum 25	
Softening Point (°F) AASHTO T53		Minimum 70	

Superpave PG Binder Table 2 – PG 58-22			
Test and Method	Test Temperature	Specification	Notes
Original Binder			
Flash Point, AASHTO T 48		Minimum 446 °F (230 °C)	
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 3.0 Pa·s	a
Mass Loss (%) AASHTO T 240	325± 1.8 °F (163± 1°C)	Maximum 0.50	b, c
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	136 °F (58 °C)	Minimum 1.00 kPa	
Rolling Thin Film Oven Test Residue (RTFO) AASHTO T 240			
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	136 °F (58 °C)	Minimum 2.20 kPa	
Pressure Aging Vessel (PAV) AASHTO R 28			
Dynamic Shear, G* sin δ AASHTO T 315 10 rad/sec	72 °F (22 °C)	Maximum 5000 kPa	
Creep Stiffness AASHTO T 13 @ 60 sec	10 °F (-12 °C)	S (Stiffness), Maximum 300 MPa	
		m-value, Minimum 0.300	

Superpave PG Binder Table 3 – PG 64-22			
Test and Method	Test Temperature	Specification	Notes
Original Binder			
Flash Point, AASHTO T 48		Minimum 446 °F (230 °C)	
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 3.0 Pa·s	a
Mass Loss (%) AASHTO T 240	325± 1.8 °F (163± 1°C)	Maximum 0.50	b
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	147 °F (64 °C)	Minimum 1.00 kPa	
Rolling Thin Film Oven Test Residue (RTFO) AASHTO T 240			
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	147 °F (64 °C)	Minimum 2.20 kPa	
Pressure Aging Vessel (PAV) AASHTO R 28			
Dynamic Shear, G* sin δ AASHTO T 315 10 rad/sec	77 °F (25°C)	Maximum 5000 kPa	
Creep Stiffness AASHTO T 13 @ 60 sec	10 °F (-12 °C)	S (Stiffness), Maximum 300 MPa	
		m-value, Minimum 0.300	

Superpave PG Binder Table 4 – PG 67-22			
Test and Method	Test Temperature	Specification	Notes
Original Binder			

Flash Point, AASHTO T 48		Minimum 446 °F (230 °C)	
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 3.0 Pa·s	a
Mass Loss (%) AASHTO T 240	325± 1.8 °F (163± 1°C)	Maximum 0.50	b
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	153 °F (67 °C)	Minimum 1.00 kPa	
Rolling Thin Film Oven Test Residue (RTFO) AASHTO T 240			
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	153 °F (67 °C)	Minimum 2.20 kPa	
Pressure Aging Vessel (PAV) AASHTO R 28			
Dynamic Shear, G* sin δ AASHTO T 315 10 rad/sec	80 °F (26.5 °C)	Maximum 5000 kPa	
Creep Stiffness AASHTO T 13 @ 60 sec	10 °F (-12 °C)	S (Stiffness), Maximum 300 MPa	
		m-value, Minimum 0.300	

Superpave PG Binder Table 5 – PG 76-22 PMA			
Test and Method	Test Temperature	Specification	Notes
Original Binder			
Flash Point, AASHTO T 48		Minimum 446 °F (230 °C)	
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 3.0 Pa·s	a
Mass Loss (%) AASHTO T 240	325± 1.8 °F (163± 1°C)	Maximum 0.50	b
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	169 °F (76 °C)	Minimum 1.00 kPa	
Dynamic Shear, Phase Angle δ AASHTO T 315	169 °F (76 °C)	Maximum 75°	
Rolling Thin Film Oven Test Residue (RTFO) AASHTO T 240			
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	169 °F (76 °C)	Minimum 2.20 kPa	
Multiple Stress Creep Recovery, Jnr, 3.2 AASHTO T 350	169 °F (76 °C)	Maximum 1.0 kPa^{-1} Maximum $J_{nr,diff}$ = 75 %	
Multiple Stress Creep Recovery, % Recovery AASHTO M 332	169 °F (76 °C)	$\%Recovery_{3.2} > 29.37 (J_{nr,3.2})^{-0.2633}$	
Pressure Aging Vessel (PAV) AASHTO R 28			
Dynamic Shear, G* sin δ AASHTO T 315 10 rad/sec	88 °F (31 °C)	Maximum 6000 kPa	
Creep Stiffness AASHTO T 13 @ 60 sec	10 °F (-12 °C)	S (Stiffness), Maximum 300 MPa m-value, Minimum 0.300	

Superpave PG Binder Table 6 – PG 76-22E			
Test and Method	Test Temperature	Specification	Notes
Original Binder			
Flash Point, AASHTO T 48		Minimum 446 °F (230 °C)	
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 8.0 Pa·s	a
Mass Loss (%) AASHTO T 240	325± 1.8 °F (163± 1°C)	Maximum 0.50	b
Dynamic Shear, G*/sin δ AASHTO T 315	169 °F (76 °C)	Minimum 3.00 kPa	

10 rad/sec			
Dynamic Shear, Phase Angle δ AASHTO T 315	169 °F (76 °C)	Maximum 75°	
Rolling Thin Film Oven Test Residue (RTFO) AASHTO T 240			
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	180 °F (82 °C)	Minimum 2.20 kPa	
Multiple Stress Creep Recovery, Jnr, 3.2 AASHTO T 350	180 °F (82 °C)	Maximum 0.50 kPa^{-1} Maximum $J_{nr,diff}$ = 75 %	
Multiple Stress Creep Recovery, % Recovery AASHTO M 332	180 °F (82 °C)	$\%Recovery_{3.2} > 29.37 (J_{nr,3.2})^{-0.2633}$	
Pressure Aging Vessel (PAV) AASHTO R 28			
Dynamic Shear, G* sin δ AASHTO T 315 10 rad/sec	88 °F (31 °C)	Maximum 5000 kPa	
Creep Stiffness AASHTO T 13 @ 60 sec	10 °F (-12 °C)	S (Stiffness), Maximum 300 MPa m-value, Minimum 0.300	

Superpave PG Binder Table 7 – PG 76-22 ARB			
Test and Method	Test Temperature	Specification	Notes
Original Binder			
Flash Point, AASHTO T 48		Minimum 446 °F (230 °C)	
Rotational Viscosity AASHTO T 316	275 °F (135 °C)	Maximum 3.0 Pa·s	a, d
Mass Loss (%) AASHTO T 240	325± 1.8 °F (163± 1°C)	Maximum 0.50	b, d
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	169 °F (76 °C)	Minimum 1.00 kPa	d, e
Rolling Thin Film Oven Test Residue (RTFO) AASHTO T 240			
Dynamic Shear, G*/sin δ AASHTO T 315 10 rad/sec	169 °F (76 °C)	Minimum 2.20 kPa	d, e
Pressure Aging Vessel (PAV) AASHTO R 28			
Dynamic Shear, G* sin δ AASHTO T 315 10 rad/sec	88 °F (31 °C)	Maximum 5000 kPa	d, e
Creep Stiffness AASHTO T 13 @ 60 sec	10 °F (-12 °C)	S (Stiffness), Maximum 300 MPa	
		m-value, Minimum 0.300	
Polymer Separation Test ASTM D7173 Softening Point	(325.4 ± 9°F) 163 ± 5 ° C	Maximum 18 °F (10 °C) difference between top and bottom specimens	
AASHTO T 51, 5 cm per min, cm	77°F (25°C)	Ductility Minimum 19 cm	
ASTM D 5329, %	77°F (25°C)	Resilience Minimum 10 percent	

Notes:

a. The Department may waive this requirement if the supplier warrants the asphalt binder can be adequately pumped, mixed and/or sprayed at temperatures meeting all applicable safety standards.

b. Heat loss by AASHTO: T 179 may be accepted in lieu of mass loss by AASHTO: T 240.

c. The maximum Mass Loss shall be ≤ 1%, when used in conjunction with Bituminous Surface Treatment (Section 424).

d. PG 64-22 or PG 67-22 modified to meet PG 76-22 ARB using GTR, via the dry method, will be evaluated using complete analysis for compliance with PG 76-22 ARB requirements prior to mixture production using laboratory blended materials. PG 64-22 or PG 67-22 modified to meet PG 76-22 ARB using GTR via the dry method, will be evaluated for compliance with original DSR testing requirements for PG 76-22 ARB during mixture production using abson recovery in accordance with GDT 119 in compliance with AC sampling frequencies established in GSP 21 sub-section A.9.

e. AASHTO T 315 will be performed at a 2 mm gap for PG 76-22 ARB.

Thoroughly blend the composite materials at the supply facility prior to being loaded into the transport vehicle if modification is required in accordance with 820.2.01. Ensure all blending procedures, formulation, and operations are approved by the Office of Materials.

3. Certification:

Provide certified test results from an approved, certified laboratory of blends for proposed PG asphalt for each specification characteristic of the asphalt cement proposed for shipment. Provide the certified results to the State Materials Engineer as required in Standard Operating Procedure (SOP 4).

The State Materials Engineer may interrupt production until test results are known in the event there is reason to suspect a sample will be outside specification limits. Mixture placed incorporating modified binders determined to not meet specification requirements may be subject to removal at the recommendation of the State Materials Engineer.

B. Materials Warranty

General Provisions 101 through 150.

LUMPKIN COUNTY

SPECIAL PROVISION

Section 828—Hot Mix Asphaltic Concrete Mixtures

Delete Section 828 and substitute the following:

828.1 General Description

This specification includes the requirements for hot mix asphaltic concrete mixtures, including:

- Open-graded surface mixtures (OGFC and PEM)
- Stone Matrix Asphalt mixtures (SMA)
- Superpave mixtures
- Fine-graded (4.75 mm) mixtures

828.1.01 Definitions

The Nominal Maximum Sieve Size is one standard sieve size larger than the first sieve to retain more than ten percent of the aggregate, per AASHTO R35. Mixture types in this section are identified according to Nominal Maximum Sieve Size.

828.1.02 Related References

A. Standard Specifications

Section 400-Hot Mix Asphaltic Concrete Construction

Section 402-Hot Mix Recycled Asphaltic Concrete

Section 800–Coarse Aggregate

Section 802–Aggregates for Asphaltic Concrete

Section 819–Fiber Stabilizing Additives

Section 820–Asphalt Cement

Section 831–Admixtures

Section 882–Lime

Section 883–Mineral Filler

B. Referenced Documents

AASHTO R30

AASHTO R35

AASHTO T 321

AASHTO T 112

AASHTO T 209

AASHTO T 305

AASHTO T 312

AASHTO T 245

AASHTO T 324

AASHTO T 340

SOP-36

SOP-2

GDT 1

GDT 56

GDT 63

GDT 66

GDT 114

GDT 115

GDT 123

QPL 1

QPL 2

QPL 7

QPL 26

QPL 41

QPL 77

QPL 81

828.2 Materials

A. Requirements

Use approved hot mix asphalt concrete mixtures that meet the following requirements:

1. Produce each asphalt mixture according to a Department approved Job Mix Formula and Asphalt Mix Design, see Subsection 400.1 for submittal and approval of Job Mix Formulas.
2. Ensure individual acceptance test results meet the Mixture Control Tolerances specified in the appropriate table below, Subsections 828.2.01 through 828.2.04.
3. Ensure the Engineer approves all materials used to prepare and place the mixtures before incorporating them into the Work. Use only the ingredients listed in the approved Asphalt Mix Design and Job Mix Formula. For virgin aggregates use sources meeting the requirements of Section 802 and are listed in QPL 1 or QPL 2; for mixes in which local sand is permitted, use the approved sand source identified in the mix design. For mixtures containing Reclaimed Asphalt Pavement (RAP), use only RAP from the approved stockpile identified in the mix design. Use asphalt cement meeting the requirements of Section 820, from a source listed in QPL 7.
4. Obtain approved SMA mix designs, Superpave mix designs and 4.75 mm mix designs from a mix design laboratory certified by the Department. Obtain approved mix designs for types PEM and OGFC mixtures from the Department's Office of Materials, which produces and furnishes these mix designs.
5. Ensure all SMA mix designs are designed in accordance with GDT-123 (“Determining the Design Proportions of Stone Matrix Asphalt Mixtures”). Ensure SMA mix designs are verified and approved by the Department prior to use. Ensure Superpave and 4.75 mm mix designs are designed in accordance with SOP-2 ("Control of Superpave Bituminous Mixture Designs") and are approved by the Department as provided therein. Ensure these mixes are designed by a laboratory and technician certified in accordance with SOP-36, ("Certification of Laboratories and Personnel for Design of SMA and Superpave Asphalt Mixtures").
6. Use only mixtures composed of the aggregate groups and blends indicated in the Proposal and Plans by their pay item designations, defined as follows:

Table 1 – Aggregate Groups

Pay Item Designation	Allowable Aggregate Groups

Group I or II	Group I, Group II, or Blend I
Group II only	Group II only
Blend I	Either 100% Group II material or a blend of Group I and Group II. Do not use Group I material for more than 60%, by weight, of the total aggregate nor more than 50%, by weight, of the coarse aggregate fraction.

7. For patching or leveling use Group I, Group II, or Blend I. Mix types for patching and leveling are specified in Subsection 400.3.03.B.
8. Include lime (hydrated lime) from an approved source and meeting the requirements of Section 882 in all paving courses except as otherwise provided in the Contract. For a list of approved sources of lime, see QPL 41.
   a. Add lime to each mixture at the rate prescribed in the approved mix design.
   b. Ensure mix designs using only virgin aggregate include lime at a minimum rate of 1.00 % of the total dry aggregate weight. Ensure mix designs using RAP include lime at a minimum rate equal to 1.00 % of the virgin aggregate fraction plus 0.50 % of the aggregate in the RAP fraction.
   c. Add more lime or add lime plus an approved Heat-Stable Anti-Stripping Additive meeting the requirements of Section 831, if necessary to meet requirements for mixture properties, and pursuant to an approved mix design. However, the Department will not make additional payment for these materials. For a list of sources of Heat-Stable Anti-Stripping Additives, see QPL 26.
   d. Where specifically allowed in the contract on LARP, airport, and parking lot projects, an approved Heat-Stable Anti-Stripping Additive meeting the requirements of Section 831 may be substituted for hydrated lime. Ensure the mix gradation is adjusted to replace the lime with an equivalent volume of fines passing the 0.075 mm sieve. Add Heat-Stable Anti-stripping Additive at a minimum rate of 0.5 percent of the asphalt cement portion.
9. Use performance grade PG 64-22 or PG 67-22 asphalt cement in all mix designs and mixtures except as follows:
   a. The State Materials Engineer will determine the performance grade to be used, based on Table 2 – Binders Selection Guideline for Reclaimed Asphalt Pavement (RAP) Mixtures, AASHTO M323 and laboratory testing results as required in Section 828.2.B for mixtures containing ≥ 25% equivalent binder replacement for RAP/RAS mixtures.
   b. Use only grade PG 76-22, excluding shoulder construction in the following mixes: all SMA, 12.5 mm PEM, 9.5 mm and 12.5 mm OGFC, 12.5 mm Superpave, on projects with two-way ADT greater than 25,000; and in all mixtures for which polymer-modified asphalt is specified in the pay item.
10. Use of local sand is restricted as follows:
   a. Do not place mixtures containing local sand on the traveled way of the mainline or ramps of the Interstate System. Mixtures with local sand may be used for shoulder construction on these facilities.
   b. Ensure local sand will not constitute more than 20 % of the total aggregate weight of any mix design or production mix.
   c. Subject to the above limits, 19 mm, 12.5 mm, and 9.5 mm Superpave mix designs and 4.75 mm mix designs containing local sand may be used on projects with a current ADT not exceeding 4,000 vpd providing that all performance testing meets specified requirements.
   d. 25 mm Superpave mix designs containing not more than 20 % local sand may be used on all facilities except the main line and ramps of the Interstate System.
   e. Obtain local sand for use in asphalt mixtures from a source approved by the Department.
   f. Approval of local sand sources: The Department will sample, test, and approve sources of local sand. Ensure local sand contains no more than 7.0 % clay by weight and is free of foreign substances, roots, twigs, and other organic matter. Ensure sand is free of clay lumps, as determined by AASHTO T 112, and has a sand equivalent value exceeding 25%, as determined by GDT 63.

B. Fabrication

1. Design procedures: For all Superpave and 4.75 mm mixes, ensure conformance with the Superpave System for Volumetric Design (AASHTO T 312 and AASHTO R30), as adapted in SOP-2. Ensure Superpave mixes are designed at a design gyration number (N_{des}) of 65 gyrations and initial gyration number (N_{ini}) of 6 gyrations.

Ensure 4.75 mm mixes, (N_{des}) are designed at 50 gyrations, and (N_{ini}) at 6 gyrations. Open-graded mix designs will be designed by the Department in accordance with GDT 114. In all cases, the procedure for measuring Maximum Specific Gravity (G_{mm}) is AASHTO T 209. In addition to gradation and volumetric analysis, ensure mix designs include the following performance tests, as applicable.

2. Performance Test:
   a. Permeability test: Ensure Superpave and Stone Matrix mix designs include testing according to GDT -1 Measurement of Water Permeability of Compacted Asphalt Paving Mixtures. Ensure specimen air voids for this test are 6.0 ±1.0 %. The average permeability of three specimens may not exceed 3.60 ft per day (125 $\times 10^{-5}$cm per sec).
   b. Moisture susceptibility test: Fabricate and test specimens in accordance with GDT 66, when required by the Office of Materials and Testing due to visible signs of stripping in laboratory fabricated or plant produced asphaltic concrete mixtures, Ensure specimen air voids for this test are 7.0 ±1.0% for all mixes excluding Stone Matrix mixes. Ensure specimen air voids for this test are 6.0 ± 1.0% for Stone Matrix mixes. The minimum tensile splitting ratio is 0.80, except a tensile splitting ratio of no less than 0.70 may be acceptable if all individual strength values exceed 100 psi (690 kPa). Ensure average splitting strength of the three conditioned and three controlled samples are not less than 60 psi (415 kPa) for either group. Ensure retention of coating as determined by GDT 56 is not less than 95%.
   c. Hamburg Wheel-Tracking Test for rutting and moisture susceptibility test: Ensure mix designs of all mix types except Open-graded Surface Mixes (OGFC and PEM), and Open-graded Crack Relief Interlayer (OGI) mix, include testing in accordance with AASHTO T 324. Ensure specimen air voids for this test are 7.0 ± 1.0% for all mix types and at a testing temperature of 50°C (122°F). Use the testing and acceptance criteria established in Table 2.

Table 2 – Hamburg Wheel Tracking Device Testing and Acceptance Criteria

Binder Performance Grade (PG)	Mix Type	Number of Passes	Maximum Rut Depth	Stripping Inflection Point
PG 64-22 and PG 67-22	4.75 mm, 9.5 mm SP Type I, and 9.5 mm SP Type II	15,000	≤ 12.5 mm	> 15,000
PG 64-22 and PG 67-22	12.5 mm SP, 19 mm SP and 25 mm SP	20,000	≤ 12.5 mm	> 20,000
PG 76-22	All Mix types	20,000	≤ 12.5 mm	> 20,000

Tested specimens shall be inspected for any visible signs of stripping and any mix design's tested specimens that fail to maintain 95% of asphalt cement coating, as described in GDT 56 section D.2.d, will be required to meet specified requirements for GDT 66 as detailed in 828.2.B.2.b.

   d. Fatigue testing: The Department may verify dense-graded mix designs by fatigue testing according to AASHTO T 321 or other procedure approved by the Department.

C. Acceptance

See Subsection 106.03 and Section 400. Ensure individual test results meet the Mixture Control Tolerances listed in Subsections 828.2, 828.2.01 ,828.2.02, 828.2.03, or 828.2.04, whichever applies with the following exception. Ensure field verification results for rutting susceptibility tests performed on laboratory fabricated and/or roadway cores obtained from asphalt plant produced mixtures meet specified requirements for AASHTO T 324 as detailed in Subsection 828.2.B.2.c. All GDOT approved mix designs are required to have full field mix design verifications, using plant produced mixture, sampled by the contractor and submitted to the applicable GDOT laboratory (Central or District) at a minimum of once per two years. Field mix design verification results that fail to comply with performance testing specified in Subsection 828.2.B will require a complete laboratory mix design verification, to be completed by the original mix designer, for continued use of that design. If a mix design has not been produced within two years, a full field mix design verification will be sampled by the contractor and submitted to the applicable GDOT laboratory (Central or District) on the first Lot produced thereafter. Any mix design that fails to meet performance test

requirements established in Subsection 828.2.B, using laboratory fabricated specimens due to failing field mix design results, may subject that mix design to invalidation after the field mix design verification results are confirmed with a second field mix design verification. Field mix design verifications as specified in Section 402, Section 400, SOP 2 and GSP 21, are not precluded by the requirements specified herein.

D. Materials Warranty

See General Provisions 101 through 150.

828.2.01 Open-Graded Surface Mixtures

A. Requirements

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure Open-Graded Surface Mixtures meet the following mixture control tolerances and mix design criteria:

Sieve Size	Mixture Control Tolerance, %	Design Gradation Limits, % Passing		
		9.5 mm OGFC	12.5 mm OGFC	12.5 mm PEM
3/4 in (19 mm) sieve	±0.0		100*	100*
1/2 in (12.5 mm) sieve	±6.1	100*	85-100	80-100
3/8 in (9.5 mm) sieve	±5.6	85-100	55-75	35-60
No. 4 (4.75 mm) sieve	±5.7	20-40	15-25	10-25
No. 8 (2.36 mm) sieve	±4.6	5-10	5-10	5-10
No. 200 (75 µm) sieve	±2.0	2-4	2-4	1-4
Range for % AC	±0.4	6.0-7.25	5.75-7.25	5.5-7.0
Class of stone (Section 800)		"A" only	"A" only	"A" only
Drain-down (AASHTO T305), %		<0.3	<0.3	<0.3

* Mixture control tolerance is not applicable to this sieve for this mix.

1. In 12.5 mm and 9.5 mm OGFC and 12.5 mm PEM mixes, use only PG 76-22 asphalt cement (specified in Section 820).
2. Ensure all OGFC and PEM mixes include a stabilizing fiber of the type (cellulose or mineral) specified in the mix design and meeting the requirements of Section 819. Ensure the dosage rate is as specified in the mix design and sufficient to prevent drain-down exceeding the above tolerance.

B. Fabrication

See Section 400.

828.2.02 Stone Matrix Asphalt Mixtures

A. Requirements

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure Stone Matrix Asphalt mixtures meet the following mixture control tolerances and mix design criteria:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing		
		9.5 mm SMA	12.5 mm SMA	19 mm SMA

1- in (25 mm) sieve	±0.0			100*
3/4 in (19 mm) sieve	±7.0	100*	100*	90-100
1/2 in (12.5 mm) sieve	±6.1	98-100**	85-100	44-70
3/8 in (9.5 mm) sieve	±5.6	70-100	50-75	25-60
No. 4 (4.75 mm) sieve	±5.7	28-50	20-28	20-28
No. 8 (2.36) mm sieve	±4.6	15-30	16-24	15-22
No. 50 (300 µm) sieve	±3.8	10-17	10-20	10-20
No. 200 (75 µm) sieve	±2.0	8-13	8-12	8-12
Range for % AC (Note 1)	±0.4 (Note 2)	6.0-7.5	5.8-7.5	5.5-7.5
Design optimum air voids (%)		3.5 ±0.5	3.5 ±0.5	3.5 ±0.5
% aggregate voids filled with AC (VFA)		70-90	70-90	70-90
Tensile splitting ratio after freeze-thaw cycle GDT-66		80%	80%	80%
Drain-down (AASHTO T305), %		<0.3	<0.3	<0.3

*Mixture control tolerance is not applicable to this sieve for this mix.

**Mixture control tolerance is ± 2.0% for this sieve for 9.5 mm SMA mixes placed at spread rates greater than 135 lb/yd^2. For 9.5 mm SMA mixes placed at spread rates of 135 lb/yd^2 or less, 100 % passing is required on this sieve.

Note 1: Range for % AC is Original Optimum AC (OOAC) at 35 gyrations (Gyratory compactor) or 50 blows (Marshall compactor) prior to Corrected Optimum AC (COAC) calculation detailed in GDT 123 (Appendix A)

Note 2: Quality Acceptance Test Results for AC content that deviate > ± 0.3% from the approved Job Mix Formula (JMF) consistently over three lots may subject the mix to a revised AC content on project JMF at the discretion of the State Materials Engineer based on statistical trend.

1. Ensure SMA mixtures are compacted at 35 gyrations with the Superpave Gyratory compactor or 50 blows with the Marshall compactor.
2. Ensure SMA mixtures contain mineral filler and fiber stabilizing additives and meet the following requirements:
   a. Asphalt cement grade PG-76-22 (specified in Section 820) is required in all SMA mixtures.
   b. Aggregates for SMA meet the requirements of Subsection 802.2.02.A.3.
   c. Use the approved mineral filler specified in the mix design and meeting the requirements of Section 883 Approved sources of mineral filler are listed in QPL 81.

   Use the approved Fiber Stabilizing Additive of the type (cellulose or mineral) specified in the mix design and meeting the requirements of Section 819. Approved sources of Fiber Stabilizing Additive are listed in QPL 77. The dosage rate will be as specified in the mix design and sufficient to prevent drain-down exceeding the above tolerance.

B. Fabrication

See Section 400.

828.2.03 Superpave Asphalt Concrete Mixtures

A. Requirements for Superpave Mixtures (except Parking Lot Mixtures)

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure Superpave Asphalt Concrete mixtures meet the following mixture control tolerances and mix design limits:

1. Gradation limits for Superpave mixtures are as follows:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing				
		9.5 mm Superpave Type I	9.5 mm Superpave Type II	12.5 mm Superpave (Note 1)	19 mm Superpave	25 mm Superpave
1½ in (37.5 mm)						100*
1- in (25.0 mm)	± 8.0			100*	100*	90-100
3/4 in (19.0 mm)	±8.0**	100*	100*	98-100****	90-100	55-89**
1/2 in (12.5 mm)	±6.0***	98-100****	98-100****	90-100	60-89***	50-70
3/8 in (9.5 mm)	±5.6	90-100	90-100	70-89	55-75	
No. 4 (4.75 mm)	±5.6	65-85	55-75			
No. 8 (2.36 mm)	±4.6	48-55	42-47	38-46	32-36	30-36
No. 200 (75 µm)	±2.0	5.0-7.0	5.0-7.0	4.5-7.0	4.0-6.0	3.5-6.0
Range for % AC (Note 3)	± 0.4 (Note 2)	5.50-7.25	5.25-7.00	5.00-6.25	4.25-5.50	4.00-5.25

* Mixture control tolerance is not applicable to this sieve for this mix.

** Ensure mixture control tolerance is within ± 10.0% for this sieve for 25 mm Superpave.

***Ensure mixture control tolerance is within ± 8.0% for this sieve for 19 mm Superpave.

***Ensure mixture control tolerance is within ± 2.0% for this sieve for 12.5 mm and 9.5 mm mixes.

Note 1: Use PG 76-22 in 12.5 mm Superpave, excluding shoulder construction, on all projects with ADT greater than 25,000 as detailed in the Contract Pay Item.

Note 2: Quality Acceptance Test Results for AC content deviating > ± 0.3 % from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.

Note 3: Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D).

2. Volumetric limits are as follows:

Design Parameter	Mix Type	Limits

% of Max. Specific Gravity (Gmm) at design gyrations, (Ndes)	All	96%
% Gmm at the initial number of gyrations, Ni	All	91.5% maximum
% voids filled with asphalt (VFA) at Ndes	9.5 mm Type I	Min. 72; Max. 80
	9.5 Type II and 12.5 mm	Min. 72; Max. 76
	19 mm	Min. 71; Max 76
	25 mm	Min. 69; Max 76
Fines to effective asphalt binder ratio (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)*	All	> 7.00
Minimum % Voids in Mineral Aggregate (VMA) Note: VMA shall be calculated using the effective specific gravity of the aggregate (Gse). See SOP-2SP.	25 mm	13.0
	19 mm	14.0
	12.5 mm	15.0
	9.5 Type I	16.0
	9.5 Type II	16.0

*Superpave Mixtures approved prior to January 31, 2012, may be adjusted to meet Minimum Film Thickness requirements by the State Materials Engineer.

B. Requirements for Superpave Parking Lot Mixes (NOT FOR STANDARD HIGHWAY/STREET PAVING)

1. Surface layers for parking facilities:

Sieve Size	Mixture Control Tolerance	Design Gradation Limits, Percent Passing		
		4.75 mm Mix	9.5 mm Superpave Type I	9.5 mm Superpave Type II
1- in (25.0 mm) sieve	± 8.0			
3/4 in (19.0 mm) sieve	±8.0**		100*	100*
1/2 in (12.5 mm) sieve	±6.0	100*	98-100****	98-100****
3/8 in (9.5 mm) sieve	±5.6	90-100	90-100	90-100
No. 4 (4.75 mm) sieve	±5.6	75-95	65-85	55-75
No. 8 (2.36 mm) sieve	±4.6	60-65	48-55	42-47
No. 50 (300 µm) sieve	+3.8	20-50		
No. 200 (75 µm) sieve	±2.0	4-12	5.0-7.0	5.0-7.0
Range for Total AC	+ 0.4	6.00 - 7.50	5.50 - 7.25	5.25 - 7.00

2. Subsurface layers for parking facilities:

Sieve Size	Mixture	Design Gradation Limits, Percent Passing

	Control Tolerance	12.5 mm Superpave	19 mm Superpave	25 mm Superpave
				100*
1- in (25.0 mm) sieve	± 8.0	100*	100*	90-100
3/4 in (19.0 mm) sieve	±8.0**	98-100****	90-100	55-89**
1/2 in (12.5 mm) sieve	±6.0***	90-100	60-89***	50-70
3/8 in (9.5 mm) sieve	±5.6	70-89	55-75	
No. 8 (2.36 mm) sieve	±4.6	38-46	32-36	30-36
No. 200 (75 µm) sieve	±2.0	4.5-7.0	4.0-6.0	3.5-6.0
Range for Total AC	+ 0.4	5.00 - 6.25	4.25 - 5.50	4.00 - 5.25

All * and notes apply to both 828.2.03.B.1 and 828.2.03.B.2.

*Mixture control tolerance is not applicable to this sieve for this mix.

**Ensure mixture control tolerance is within ±10.0% for this sieve for 25 mm Superpave mixes.

*** Ensure mixture control tolerance is within ±8.0% for this sieve for 19 mm Superpave mixes.

****Ensure mixture control tolerance is within ±2.0% for this sieve for 12.5 mm and 9.5 mm Superpave mixes.

Note 1: Quality Acceptance Test Results for AC content deviating > ± 0.3 % from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.

Note 2: Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D)..

3. Volumetric limits for parking facilities are as follows:

Design Parameter	Mix Type	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, Ndes)	All	96%
% Gmm at the initial number of gyrations, Ni	All	91.5 % maximum
% voids filled with asphalt (VFA) at Ndes	9.5 mm Type I	Min. 72; Max. 80
	9.5 Type II and 12.5 mm	Min. 72; Max. 78
	19 and 25 mm	Min. 71; Max 76
Fines to effective asphalt binder ration (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)*	4.75 mm	> 6.00
	All other types	> 7.00
Minimum % Voids in Mineral Aggregate (VMA) Note: VMA shall be calculated using the effective specific gravity of the aggregate (Gse). See SOP-2	25 mm	13.0
	19 mm	14.0
	12.5 mm	15.0
	9.5 mm Types I, II	16.0

* Mixtures approved prior to January 31, 2012, may be adjusted to meet Minimum Film Thickness requirements by the State Materials Engineer.

C. Fabrication

See Section 400.

828.2.04 Fine-Graded Mixtures

A. Requirements

Produce the mixture according to an approved mix design and Job Mix Formula. Ensure ~~that~~ fine-graded mixtures meet the following mixture control tolerances and design limits:

ASPHALTIC CONCRETE - 4.75 mm Mix		
Sieve Size	**Mixture Control Tolerance**	**Design Gradation Limits, % passing**
1/2 in (12.5 mm) sieve*	±0.0	100*
3/8 in (9.5 mm) sieve	±5.6	90-100
No. 4 (4.75 mm) sieve	±5.7	75-95
No. 8 (2.36 mm) sieve	±4.6	60-65
No. 50 (300 μm) sieve	±3.8	20-50
No. 200 (75 μm) sieve	±2.0	4-12
Range for % AC	±0.4	6.00 – 7.50
Design optimum air voids (%)		4.0 – 7.0
% Aggregate voids filled with AC		60 - 80
Minimum Film Thickness (microns)		> 6.00

* Mixture control tolerance is not applicable to this sieve for this mix.

Note 1: Quality Acceptance Test Results for AC content deviating > ± 0.3 % from the approved Job Mix Formula (JMF) consistently over three Lots may subject the mix to a revised AC content on the project JMF at the discretion of the State Materials Engineer based on statistical trend.

Note 2: Range for % AC is Original Optimum AC (OOAC) at 50 gyrations prior to the Corrected Optimum AC (COAC) calculation detailed in SOP 2 (Appendix D).

B. Fabrication

See Section 400.

C. Acceptance

See Subsection 106.3 and Section 400. Ensure individual test results meet the Mixture Control Tolerances listed in Subsections 828.2, 828.2.01, 828.2.02, 828.2.03, 828.2.04, whichever applies.

D. Materials Warranty

See General Provisions 101 through 150.

Office of Materials

LUMPKIN COUNTY

SUPPLEMENTAL SPECIFICATION

Section 833—Joint Fillers and Sealers

Delete Section 833 and substitute the following:

833.1 General Description

This section includes the requirements for joint fillers and sealers, as follows:

Joint Sealers	Joint Fillers
Hot-poured	Preformed
Preformed elastic	Preformed foam
Silicone sealant and bond breaker	Water-blown urethane
For bridge decks:	Elastomeric polymer type joint compound
Neoprene	
Ethylene propylene diene monomer	
For inductive loops:	
Polyurethane sealant	

833.1.01 Related References

A. Standard Specifications

Section 106–Control of Materials

Section 461–Sealing Roadway and Bridge Joints and Cracks

B. Referenced Documents

AASHTO		ASTM		
M 153	C 679	D 471	D 822	D 1622
M 213	C 793	D 573	D 1056	D 1623
M 220	C 1016	D 746	D 1171	D 1752
T 42	D 412	D 792	D 1149	D 2240

GDT 15

GDT 47

GDT 62

GDT 70

GDT 106

QPL 20

QPL 66

QPL 75

833.2 Materials

833.2.01 Preformed Joint Filler

A. Requirements

General Provisions 101 through 150.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Use preformed joint filler that meets either AASHTO M 153 or AASHTO M 213 requirements. For a list of sources, see QPL 20.

Ensure that cellulose fiber types meet the requirements of AASHTO M 213 (except for the asphalt content) and contain minimums of 0.2 percent zinc borate as a preservative and 1.5 percent waterproofing wax.

D. Materials Warranty

General Provisions 101 through 150.

833.2.02 Hot-Poured Joint Sealers

A. Requirements

1. Type

   Use a hot-poured joint sealer that is a mixture of materials compatible with asphalt, with or without rubber. The sealer shall have the following characteristics:

   - Forms a resilient and adhesive compound
   - Effectively seals joints and cracks in pavements against moisture during repeated cycles of expansion and contraction
   - Does not flow from the joint and cannot be picked up by vehicle tires at an ambient temperature of 125 °F (50 °C)

2. Compound Characteristics

   Use a compound that has a uniform pouring consistency capable of completely filling joints without forming large air holes or discontinuities.

   a. Do not pour if the compound temperature is above 450 °F (230 °C).

   b. Follow the pouring temperature and safe heating temperature set by the compound manufacturer for each lot or batch.

   c. Be sure the temperatures are shown on the label. The safe heating temperature is defined as the highest temperature to which the sealing compound can be heated and still meet all the requirements.

3. Physical Characteristics

   Use a hot-poured joint sealer that has the following properties:

Property	Required Measurement
Penetration	Less than 0.35 in (9 mm.)
Flow	Less than 0.12 in (3 mm).
Resilience	Minimum recovery of 60%.
Bond to concrete 0 °F, ± 2 °F (–18 °C, ± 1 °C)	The compound does not separate or have gaps within or between the compound and the blocks.
Compatibility (with asphaltic concrete)	Adhesion does not fail. Oily exudate does not form at the interface between the sealing compound and the asphaltic concrete. The sealant does not soften or have deleterious effects on the asphaltic concrete.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will test as follows:

Test	Method
Hot-poured joint sealers	GDT 62

D. Materials Warranty

General Provisions 101 through 150.

833.2.03 Elastomeric Polymer Type Joint Compound

A. Requirements

1. Type

   Furnish elastomeric polymer-type joint sealing compound in two components—a base compound and a curing agent.

   a. Base compound: A gasoline-resistant elastometric polymer modified with plasticizers, activators, and inert fillers.

   b. Curing agent: A blend of accelerators and extenders.

2. Compound Characteristics

   Use a sealing compound that can be mixed to a homogenous consistency at the site and applied by an approved mechanical device or poured and troweled manually.

   a. If a compound is to be machine-mixed and applied, it shall have a minimum work life of 5 minutes at 80 ºF, ± 5 ºF (27 ºC, ± 3 ºC).

   b. If a compound is to be manually mixed and applied, it shall have a minimum work life of 30 minutes at 80 ºF, ± 5 ºF (27 ºC, ±3 ºC).

   c. Use a mixture that completely fills the joints without forming air holes or discontinuities, when mixed according to the manufacturer's instructions.

   d. Use a compound that is self-leveling when placed in the joint, but that does not show appreciable flow or movement along a superelevated joint.

   e. Use material that does not soften or show any apparent defect after being immersed in water for 7 days.

   f. Use a material that forms a tack-free, rubber-like compound that seals pavement or bridge joints within 24 hours of application.

3. Physical Properties

   Use material that has the following physical properties:

Property	Required Measurement
Cone penetration	Between 0.1 in (2.5 mm) and 0.39 in (10 mm)
Flow	No appreciable flow
Resilience (air- and oven-cured samples)	Minimum recovery of 75%
Bond	No cracks, separation, or other opening over 1/ 4 in. (6 mm) deep in the sealer or between the sealer and block
Solubility	Not to exceed 2 percent; no apparent defects that affect the material as a sealant

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will test as follows:

Test	Method
Elastomeric joint compound	GDT 15

D. Materials Warranty

General Provisions 101 through 150.

833.2.04 Preformed Elastic Joint Sealer

A. Requirements

This section also covers adhesives and lubricants for the sealers.

1. Type

   Use a preformed elastic joint sealer that is a vulcanized elastomeric compound using polymerized chloroprene as the only basic elastomer. The joint sealers include both open and closed cell sealers.

2. Certification
   a. Submit certified test results of each lot of the joint sealer materials furnished to each Project, either from your tests or from the manufacturer of the preformed joint sealer.
   b. The Department will conduct the joint sealer recovery test on random samples from each shipment received or each manufacturer's lot.
   c. Submit certified test results of each lot of the lubricant furnished to each Project, either from your tests or from the manufacturer of the joint sealer lubricant/adhesive or adhesive.
3. Preformed Open Cell Joint Sealer
   a. Bridge and Roadway Seals: Use sealer that meets the following physical requirements:

Physical Property	Requirement
Tensile strength	Min. 2,000 psi (14 MPa)
Elongation at break	Min. 250%
Hardness, Type A durometer	55±5
Oven aging, 70 hours @ 212 °F (100 °C) Tensile strength, change Elongation, change Hardness, change	 Max. -30% Max. -40% +10 points
Oil swell, ASTM oil No. 3: Volume change, 70 hrs. @ 212 °F (100 °C)	 Max. 80%
Ozone resistance, 20% strain: 300 ppm in air, 70 hrs. @ 100 °F (38 °C) (wipe with solvent to remove surface contaminants)	 No cracks
Joint sealer recovery under 50% deflection: Recovery after 70 hrs. @ 212 ºF (100 ºC) Recovery after 72 hrs. @ 14 ºF (-10 ºC) Recovery after 22 hrs. @ –20 ºF (-29 ºC)	 Min. 85% Min. 88% Min. 83%

b. Bridge Seals: Use a sealer that meets the following compression/deflection requirements:

Nominal Size, in (mm)	Movement Capability*, in (mm)	Min. Force 4 lb. per linear inch (18 N per 25 mm) @ Width, in (mm)	Min. Force–30 lb per linear inch (133 N per 25 mm) Max. Force–100 lb per linear inch (445 N per 25 mm) @ Width in (mm)
2 (50)	13/16 (20)	1-7/8 (47)	1-1/16 (27)
2-1/2 (63)	1-1/8 (28)	2-3/8 (60)	1-1/4 (32)
3 (75)	1-3/8 (34)	2-7/8 (73)	1-1/2 (38)
3-1/2 (88)	1-5/8 (40)	3-3/8 (86)	1-3/8 (34)
4 (100)	1-3/4 (43)	3-7/8 (98)	2-1/8 (54)
*Movement capability is the movement allowed within the widths of the specified maximum and minimum forces. The design maximum and minimum joint width is based on these widths. The installation width depends on the temperature at the time of installation.			

c. Roadway Seals: Use a compression/deflection sealer that accommodates the movement specified on the Plans with a minimum force of 4 lbs per linear inch (18 N per linear 25 mm), not exceeding 20 lbs per linear inch (89 N per linear 25 mm), exerted on the joint faces.

4. Preformed Closed Cell Joint Sealer for Roadways

a. Use a preclosed cell polychloroprene joint sealer that meets the following physical requirements:

Physical Property	Requirement
Dimensions	Meet Plan requirements for movement and depth
Surfaces	Smooth and clean
Compression/deflection	Allow movement specified on the Plans with a minimum force of 4 lbs per linear inch (18 N per linear 25 mm) exerted on the joint faces and maximum deflection equal to 50% of the original width
Joint sealer recovery under 50% deflection	85% recovery (compressed to half original thickness for 22 hours @ 158 ºF (70 ºC), then compression removed for 48 hours at room temperature) 85% recovery after 22 hours at 0 ºF (-18 ºC)
Water absorption	Maximum 5% weight increase
Ozone resistance	No cracking after exposure of sample at 20% strain to 100 ppm ozone for 70 hours at 100 ºF (38 ºC)

5. Joint Sealer Lubricants/Adhesives

a. Lubricant/Adhesive for Preformed Roadway Seals: Use a lubricant/adhesive with the joint sealer that is a one-component polychloroprene compound, containing only soluble phenolic resins blended with antioxidants and acid acceptors in an aromatic, hydrocarbon solvent mixture. The lubricant shall have the following physical properties:

Physical Property	Requirement
Average net weight per gallon (liter)	Min. 7.84 lbs (940 grams)
Solid content	22-28% by weight
Film strength	
Tensile strength	Min. 2,300 psi (16 MPa)
Elongation before breaking	Min. 750%

b. Adhesive for Preformed Bridge or Roadway Seals: Use an adhesive that is a one-part moisture curing polyurethane and hydrocarbon solvent mixture with the following physical properties:

Physical Property	Requirement
Average net weight per gallon (liter)	Min. 8 lbs (960 grams)
Solids content	Min. 72% by weight
Film strength (ASTM D 412)	Min. 1,200 psi (8 MPa)
Elongation before breaking	Min. 350%
Viscosity	Perform suitably with the installation equipment Remain fluid from 5 to 120 ºF (-15 to 49 ºC)

6. Product Delivery

Deliver each lot of the lubricant/adhesive in containers plainly marked with the manufacturer's name or trademark, lot number, and date of manufacture.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

1. Preformed Open Cell Joint Sealer

Test	Method
Tensile strength and elongation	ASTM D 412
Hardness	ASTM D 2240
Oven-aging	ASTM D 573
Oil swell	ASTM D 471
Ozone Resistance	ASTM D 1149
Joint sealer recovery	GDT 47
Compression/Deflection	GDT 70

2. Preformed Closed Cell Joint Seals for Roadway

Test	Method
Compression/Deflection	GDT 70
Joint sealer recovery (Run the hot recovery at 158 ºF (70 ºC) instead of 212 ºF (100 ºC). Allow seals to recover for 48 hours at room temperature before measuring.)	GDT 47
Water Absorption	ASTM D 1056
Ozone Resistance	ASTM D 471

3. Joint Sealer Lubricants/Adhesives

Test	Method
Film Strength	ASTM D 412

D. Materials Warranty

For joint sealer lubricants/adhesives:

1. Store the lubricant/adhesive at 50 º to 80 ºF (10 º to 27 ºC).
2. Retest any lubricant/adhesive not used within 270 days of its manufacture.

833.2.05 Water-Blown Urethane Joint Filler

A. Requirements

1. Type

   Furnish water-blown urethane joint filler in two components.

   a. Mix according to the manufacturer's recommendations and use in pressure relief joints and regular expansion joints.

   b. Mix the material at the site and foam it in the joint. Use closed-cell material.

2. Physical Requirements

   a. Use the material that meets the following requirements after mixing:

Times at 80 ºF, ± 5 ºF (27 ºC, ± 3 ºC)	Minimum	Maximum
Cream time (interval after mixing the two components and before the material begins to expand).	1 minute	5 minutes
Expansion time (interval between when the material starts and stops expanding).		10 minutes
Tack free time (Determine whether the material is tack free by touching lightly. Begin the time requirement for tack free time when the expansion time ends.)		10 minutes

   b. Use material that meets the following requirements after curing:

Physical Property	Requirement
Weight per cubic foot (meter)	4lbs, ± 0.4 lbs (64 kg, ± 6 kg)
Compression to 50% thickness	40 to 130 psi (275 to 895 kPa)
Recovery (compressed to 50% thickness, released, then tested 10 minutes later)	Min. 65%
Extrusion when compressed 50%	Max. 0.125 In (3 mm)
Moisture absorption	Max. 0.10 lb/ft.² (490 g/m²) of exposed area

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test as follows:

Test	Method
Weight per cubic foot (meter)	AASHTO T 42 [omit drying at 220 ºF (104 ºC)]
Compression to 50% thickness	AASHTO T 42
Recovery after compression	AASHTO M 213
Extrusion	AASHTO T 42
Moisture absorption	AASHTO T 42 (calculate absorption based on exposed area)

D. Materials Warranty

General Provisions 101 through 150.

833.2.06 Silicone Sealants and Bond Breakers

Prepare and install silicone and bond breakers according to Section 461.

A. Requirements

1. Silicone

   Furnish silicone sealant in a one-part or two part silicone formulation. Use sealant that is compatible with the surface to which it is applied. Do not use acid-cure sealants on Portland cement concrete.

   a. Use silicone that meets the physical requirements in Table 1. For a list of silicone joint sealant sources, please see QPL 66. Identify silicones as the following types:

      1) Type A—A one part, low modulus, non-sag silicone. Used to seal horizontal and vertical joints in Portland cement concrete pavements and bridges. Tooling is required.

      2) Type B—A one part, very low modulus, self-leveling silicone. Used to seal horizontal joints in Portland cement concrete pavements and bridges. Tooling is not normally required.

      3) Type C—A one part, ultra-low modulus, self-leveling silicone. Used to seal horizontal joints in Portland cement concrete pavements and bridges and joints between Portland cement concrete pavement and asphaltic concrete shoulders. Tooling is not normally required.

      4) Type D—A two part, ultra-low modulus, self-leveling, rapid cure silicone. Used to seal horizontal joints in Portland cement concrete pavements and bridges and joints between Portland cement concrete pavement and asphaltic concrete shoulders. Tooling is not required.

   b. Use silicone sealant evaluated by the National Transportation Product Evaluation Program (NTPEP).

   c. Use sealant that is compatible with the surface to which it is applied. Do not use acid-cure sealants on Portland cement concrete.

   d. Use silicone that meets the following physical requirements:

Table 1—Physical Requirements for Silicone Sealants

Type Silicone	A	B	C	D
Tensile Stress at 150% Strain, Max. psi (kPa) (Note 1)	45 (310)	40 (275)	15 (105)	25 (175)
Durometer Hardness, Shore [0 °F and 77 °F ± 3 °F (-18 °C and 25 °C ± 2 °C)] (Note 1)	"A" 10-25	"00" 40-80	"00" 20-80	"00" 40-80
Bond to Concrete Mortar, Min. psi (kPa) (Note 1) (Note 3)	50 (345)	40 (275)	35 (240)	35 (240)
Tack Free Time (Skin-over) (Max. Minutes) (Note 2)	90	90	90	30
Extrusion Rate (Min. Grams/Minute) (Note 4)	75	90	100	200-550
Non-volatile (Min. %)	90	90	90	90
Specific Gravity	1.1 - 1.5	1.1 - 1.5	1.1 - 1.5	1.2 - 1.5
Shelf Life (from date of shipment)	6 Months	6 Months	6 Months	6 Months
Movement Capability & Adhesion (Note 1)	No adhesive or cohesive failure after 10 cycles at 0 °F (-18 °C).			
Ozone and U.V. Resistance (Note 1)	No chalking, cracking or bond loss after 5,000 hours.			
Note 1: The cure time for these specimens shall be 21 days for Type A and 28 days for Type B, C and D. Specimens shall be cured at 77 °F ± 3 °F (25 °C ± 2 °C) and 50±5% relative humidity.				
Note 2: At conditions of 77 °F ± 3 °F (25 °C ± 2 °C) and 50±5% relative humidity.				
Note 3: Type C and D silicone shall also meet its bond strength requirement to asphalt concrete.				
Note 4: Type D extrusion rate shall be within the range specified.				

2. Bond Breakers

   Bond breakers shall be chemically inert and resistant to oils, gasoline, solvents, and primer, if one is required.

   Install silicone sealants over a bond breaker to prevent the sealant from bonding to the bottom of the joint.

a. Use bond breakers that are chemically inert and resistant to oils, gasoline, solvents, and primer, if one is required.

b. Do not use bond breaker that will stain or adhere to the sealant.

c. Use either a backer rod or tape bond breaker.

1) Backer Rods

Type L	Closed-cell, expanded polyethylene foam
Type M	Closed-cell, polyolefin foam with a closed-cell skin over an open-cell core

Use backer rods that meet the following physical requirements:

Physical Property	Requirement
Density	2 lb/ft³ (30 kg/m³)min.
Tensile strength	25 psi (170 kPa) min.
Water absorption	0.02 g/cm³ max.

2) Bond Breaking Tapes

Type N bond breaking tapes are made from extruded polyethylene with a pressure-sensitive adhesive on one side.

Bond breaking tapes may be used with all four types of silicone, but is suitable for bridge joints only.

Bond breaking tapes shall have a minimum thickness of .005 in (0.13 mm.).

3. Joint Sealant Certification

Submit, at no cost to the Department, a minimum of 30 gal (100 L) of material and certified test results on each lot of joint sealant furnished to a Project.

Submit a certification that verifies the sealant meets all the test requirements of this Specification, except the Bond to Concrete Mortar and Shore Durometer Hardness at 0 ºF (-18 ºC).

B. Fabrication

Prepare and install silicone and bond breakers according to Section 461,.

C. Acceptance

1. Silicone

Test the silicone as follows:

Test	Method
Tensile stress	ASTM D 412 (die C)
Durometer hardness	ASTM D 2240
Bond to concrete mortar	GDT 106
Tack free time (skin-over)	GDT 106*
Extrusion rate	GDT 106
Non-volatile	GDT 106
Specific gravity	ASTM D 792 (Method A)
Movement capability and adhesion	GDT 106
Ozone and UV resistance	ASTM C 793
*In cases of dispute, use ASTM C 679 as a referee test.	

2. Bond Breakers

Test the bond breaker backer rods as follows:

Test	Method
Density	ASTM D 1622
Tensile strength	ASTM D 1623
Water absorption	ASTM C 1016

3. Department Responsibility

   The Department will:

   a. Evaluate the sealant in the field before accepting any silicone sealants that meet the requirements of this Specification.

   b. Install the material submitted by the Contractor in roadway and/or bridge joints. The material shall be in place for two winters without failure before being accepted.

   c. Reject any sealant or bond breaker that is evaluated and approved, yet fails in actual use.

D. Materials Warranty

General Provisions 101 through 150.

833.2.07 Neoprene for Bridge Deck Joint Seals

A. Requirements

1. Type

   Use a neoprene material for bridge deck joint seals that is a vulcanized elastomeric compound with polymerized chloroprene as the only basic elastomer.

   a. Ensure the neoprene meets the physical requirements in Table 2.

Table 2—Physical Requirements for Neoprene

Test	Requirements	Test Method
Tensile strength Before aging	1500 psi (10 MPa) min.	ASTM D 412
After oven-aging for 70 hrs. @ 212 ºF (100 ºC)	30% max. loss	ASTM D 573
Elongation at breaks Before aging	250% min.	ASTM D 412
After oven aging for 70 hrs. @ 212 ºF (100 ºC)	40% max.	ASTM D 573
Hardness Type A Durometer		
Before aging	63 ± 10 points	ASTM D 2240
After oven-aging for 70 hrs. @ 212 ºF (100 ºC)	0 to +15 points change	ASTM D 2240
After aging for 70 hrs. @ 14 ºF (-10 ºC)	0 to +15 points change	ASTM D 2240
Ozone Resistance: After 70 hrs. @ 104 ºF (40 ºC), under 20% strain in 300 ppm in air (Wipe specimens with toluene before test to remove surface contaminants)	No cracks	ASTM D 1149
Weight change in oil After 22 hrs. in oil No. 2 [ASTM D 471]	45% max.	AASHTO M 220
Recover under 50% deflection (type II only)		
After 70 hrs. @ 212 ºF (100 ºC)	85% min.	AASHTO M 220
After 72 hrs. @ 14 ºF (-10 ºC)	88% min.	AASHTO M 220
After 22 hrs. @ –22 ºF (-30 ºC)	85% min.	AASHTO M 220

2. Certification

Submit certified test results on the joint seal system according to Subsection 106.05, "Materials Certification."

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test according to the methods indicated in Table 2.

D. Materials Warranty

General Provisions 101 through 150.

833.2.08 Ethylene Propylene Diene Monomer for Bridge Deck Joint Seals

A. Submittals

1. Type

Use an ethylene propylene diene monomer (EPDM) material for bridge deck joint seals that is 100 percent EPDM compound.

Ensure the compound shall meet the following physical requirements:

Physical Property	Requirement
Hardness, Type A Durometer	80 ± 5
Tensile strength	Min. 2,000 psi (14 MPa)
Elongation at break	Min. 200%
Low temperature	Not brittle at –67 ºF (-55 ºC)
Weather resistance	No cracks
Ozone resistance (70 hours, 100 ºF (38 ºC), under 20% strain, 100 ppm in air)	No cracks

2. Certification

Submit certified test results of the joint seal system according to Subsection 106.05, "Materials Certification."

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test the EPDM as follows:

Test	Method
Hardness, Type A Durometer	ASTM D 2240
Tensile strength	ASTM D 412
Elongation at break	ASTM D 412
Low temperature	ASTM D 746
Weather resistance	ASTM D 1171
Ozone resistance (70 hours, 100 ºF (38 ºC) under 20% strain, 100 ppm in air)	ASTM D 1149

D. Materials Warranty

General Provisions 101 through 150.

833.2.09 Polyurethane Sealant for Inductive Loops

A. Requirements

1. Type

Use polyurethane sealant that is a one component, moisture-curing, flexible sealant formulated to encapsulate inductive detector loop wires and leads embedded in asphaltic or Portland cement concrete. For a list of sources, see QPL 75.

2. Submit, at no cost to the Department, at least 12, 29 oz. (857 mL) cartridges of the material.
3. Physical Characteristics

   Use a sealant that will:

   - Remain flexible to –20 ºF (-30 ºC) (necessary to protect the wire from the stress of pavement movement).
   - Fully encapsulate the wire but resist flowing out on inclined or crowned roads.
   - Be compatible with asphaltic concrete.
   - Not soften the asphaltic concrete to a degree that would cause widening of the joint, when installed in a simulated joint in the laboratory.
4. Use a cured polyurethane sealant that meets the following physical requirements:

Physical Property	Requirement
Hardness, Type A Durometer	35-85
Tensile strength	Min. 150 psi (1035 kPa)
Elongation at break	Min. 200%
Flexibility 20 ºF (30 ºC)	No cracks
Weathering resistance	Slight chalking

5. Furnish certified test results of the loop sealant according to Subsection 106.05, “Materials Certification.”

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. Test the polyurethane sealant for inductive loops as follows:

Test	Method
Hardness, Type A Durometer	ASTM D 2240
Tensile strength	ASTM D 412 [die C pulled at 20 in (500 mm)/min]
Elongation at break	ASTM D 412 [die C pulled at 20 in (500 mm)/min]
Flexibility –20 ºF (-30 ºC)	25 mil (0.64 mm) free film bend (180°) over a 1/2 in (13 mm) mandrel
Weathering resistance	ASTM D 822; Weatherometer 350 hrs., cured 7 days, 77 ºF (25 ºC), 50% relative humidity

2. Department Responsibility

   The Department will:

   a. Evaluate the polyurethane sealant for inductive loops in the field before approving it for use. The material also must meet the requirements of this Specification.
   b. Install the material in asphaltic inductive loops. The material shall be in place for one winter without failure before being accepted.
   c. Reject any sealant that is evaluated and approved, yet fails in actual use.

D. Materials Warranty

General Provisions 101 through 150.

833.2.10 Preformed Foam Joint Filler

A. Requirements

1. Type

Use a preformed foam joint filler consisting of polyethylene, polypropylene, polyurethane, neoprene, natural rubber, or isomeric polymer closed-cell foam and ultraviolet, stable resistant to oils, chemicals, ozone, and weathering. Ensure the joint filler conforms to the following physical requirements:

Physical Property	Requirement	Test Method
Cell Structure (Compression—Deflection to 50% of original thickness	Closed Cell 35 – 50 psi (250 – 350 kPa)	ASTM D545
Recovery (Compress the specimen to 50% of original thickness)	80% min.	ASTM D545
Water Absorption	1% volume max.	ASTM D545
Extrusion at 50% compression of original thickness	0.25 in (6 mm) max.	ASTM D545
Density	3.5 lbs./ft^3 (56.1 kg/m^3) min	ASTM D545
Heat Resistance @ 392 °F ± 5 °F (200 ° C ± - 15 ° C)	1% max	ASTM D5249
UV Weathering (1000 hrs., Cycle A – 340 nm)	No observation change or cracking	ASTM D4329
Freeze Thaw Resistance (300 cycles)	No visual change, <10% tensile strength change	ASTM C666

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test according to ASTM D 1752.

D. Materials Warranty

General Provisions 101 through 150.

LUMPKIN COUNTY

SUPPLEMENTAL SPECIFICATION

Section 868—Bituminous Adhesive for Raised Pavement Markers

Replace Section 868 with the following:

868.1 General Description

This section includes the requirements for bituminous hot-melt adhesive used to place raised pavement markers.

868.1.01 Related References

A. Standard Specifications

Section 106—Certification of Materials

B. Referenced Documents

AASHTO	ASTM	
T 48	C 430	D 1856
T 49	D 70	D 2669
T 53	D 1754	D 2712
T 202	D 1796	D 3407

NTPEP Committee Work Plan for Evaluation of Pavement Markers and Adhesives (RPM-15)

868.2 Materials

868.2.01 Bituminous Adhesive

A. Requirements

1. Adhesive

   Use an adhesive made of asphaltic material and a homogeneously mixed filler that meets the following physical requirements:

   a. Adhesive Properties: Use the asphaltic material with filler.

	Min.	Max.	Test Method
Softening point	200° F (95 °C)	—	AASHTO T 53
Penetration, mm 3.5 oz (100 g), 5 sec., 77 °F (25 °C)	10	20	AASHTO T 49
Flow	—	0.2 in (5 mm)	ASTM D 3407 (modified in Subsection 868.2.01.C)
Viscosity, 400 °F (204 °C)	—	60 Poises (6.0 Pa-s)	ASTM D 2669 (modified in Subsection 868.2.01.C)

Flash point, C.O.C.	550 °F (285 °C)	—	AASHTO T 48

b. Asphalt Properties: Use the filler-free material derived from the extraction and Abson recovery process explained in Subsection 868.2.01.C.

	Min.	Max.	Test Method
Penetration, mm 3.5 oz (100 g), 5 sec., 77 °F (25 °C)	25	—	AASHTO T 49
Viscosity, 275 °F (135 °C)	12 Poises (1.2 Pa-s)	—	AASHTO T 202
Viscosity ratio, 275 °F (135 °C)	—	2.2	See Subsection 868.2.01.C

c. Filler Properties: Use the filler separation techniques described in Subsection 868.2.01.C.

	Min.	Max.	Test Method
Filler content, percent by weight	50	70	See Subsection 868.2.01.C
Filler fineness, percent passing			
No. 325 (45 µm) No. 200 (75 µm) No. 100 (150 µm)	75 95 100		ASTM C 430 (modified in Subsection 868.2.01.C)

d. Certification: Submit a certification from the manufacturer that includes the physical properties of the bituminous adhesives and that the material conforms with this Specification, as stated in Subsection 106.05, "Materials Certificate."

e. Participation in the National Transportation Product Evaluation Program (NTPEP) evaluation for standard (non-plowable), snow plowable, temporary and chip seal raised pavement makers and adhesives.

- Pavement Markers Adhesives shall meet the requirements and testing criteria for the NTPEP evaluation of adhesives.
- Submit to the Office of Materials & Testing (OMAT) a letter of certification from the adhesive manufacturer indicting testing was conducted by NTPEP.

2. Packaging and Labeling

a. Pack the adhesive in a self-releasing cardboard container of approximately 10 in (250 mm) that can be stacked properly.

b. Fill the containers with two 30 lb (13.5 kg) cubes that have a net weight of 60 lbs (27 kg).

c. Put the manufacturer, quantity, and batch number on the label.

d. Print "Bituminous Adhesive for Pavement Markers" on the label.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. Flow

Determine flow according to Section 6, Flow, of ASTM D 3407.

a. Set the oven temperature at 158 ° ± 2 °F (70 ° ± 1 °C).

b. Prepare samples according to Subsection 7.1 of AASHTO T 49.

2. Viscosity

Determine viscosity according to ASTM D 2669 using a spindle speed of 10 rpm.

a. Heat the adhesive to approximately 410 °F (210 °C) and then let cool.

b. Determine viscosity at 400 ° ± 1°F (204 ° ± 0.6 °C).

3. Asphalt Properties

Determine the base asphalt properties based on the material obtained from the following extraction and Abson recovery methods:

a. Extract the asphalt by heating the adhesive to the point where it will easily flow.

b. Add 125 to 150 g of adhesive to 400 mL of trichloroethylene that has a temperature of 125 ° to 150 °F (51 ° to 66 °C).

c. Stir the mixture to dissolve the asphalt.

d. Decant the trichloroethylene-asphalt mixture.

e. Recover the asphalt using the Abson recovery method described in ASTM D 1856, except do not use the extraction methods of ASTM D 2712, and do not filter the solvent-asphalt mixture.

f. Centrifuge the extraction solution of trichloroethylene and asphalt for at least 30 minutes at 770 times gravity in a batch centrifuge.

g. Decant the solution into a distillation flask. Do not include any filler sediment.

h. Apply heat and bubble carbon dioxide slowly until the solution reaches a temperature of 300 °F (149 °C).

i. Increase the carbon dioxide flow to between 800 to 900 mL per minute.

j. Maintain the decanted solution temperature between 320 ° and 335 °F (160 ° and 168 °C) with this carbon dioxide flow for at least 20 minutes and until the trichloroethylene vapors are completely removed from the distillation flask.

k. Repeat the extraction-recovery method as necessary to obtain the desired quantity of asphalt.

l. Determine penetration, 275 °F (135 °C) viscosity, and viscosity ratio with the recovered asphalt.

4. Viscosity Ratio

Determine the 275 °F (135 °C) viscosity ratio by comparing the 275 °F (135 °C) viscosity on the base asphalt before and after the Thin-Film Oven Test.

a. Perform the Thin-Film Oven Test as described in ASTM D 1754.

b. Determine the specific gravity with a pycnometer as described in ASTM D 70 for use in the Thin-Film Oven Test.

c. Calculate the 275 °F (135 °C) viscosity ratio by dividing the viscosity after the Thin-Film Oven Test by the original 275 °F (135 °C) viscosity.

5. Filler Material

Separate the filler material from the asphalt to determine filler content and filler fineness.

a. Filler Content

1) Determine the portion by weight of the adhesive that is insoluble in 1, 1, 1-trichloroethane by weighing 10.00 ± 0.01 g of solid adhesive into a centrifuge flask with a volume of approximately 100 mL, as specified in ASTM D 1796.

2) Add 50 mL of 1, 1, 1-trichloroethane to the adhesive.

3) Break the adhesive into small pieces to dissolve the solids.

4) Place the sample flask in a balanced centrifuge and spin with a minimum relative centrifugal force of 150 (as determined in Section 6 of ASTM D 1796) for 10 minutes.
5) Remove the sample flask and decant the solvent, without losing any solids.
6) Repeat the application of solvent and centrifuging until the solvent is clear and the filler is visually free of asphalt.
7) Dry the filler at 160 °, ± 5 °F (71°, ± 3 °C) to remove solvent and weigh the resulting filler.
8) Filter the decanted solvent to verify that no filler was lost.
9) Calculate the percent filler content as follows:

$$\text{Filler Content, \% by weight (g)} = \frac{\text{Filler Wt. (g) x 100}}{\text{Original Adhesive Wt. (g)}}$$

b. Filler Fineness
1) Determine filler fineness according to ASTM C 430, using No. 325 (45 µm), No. 200 (75 µm), and No. 100 (150 µm) sieves.
2) Modify this method by using a water-soluble, non-ionic wetting agent, such as Triton X-100, to aid the wetting action. Use a surfactant solution that is approximately 1 percent by weight.
3) Thoroughly wet the 1-gram dry sample in the surfactant solution.
4) Soak the sample for 30 minutes.
5) Transfer the filler to the sieve cup.
6) Spray water on the filler for two minutes.
7) Add surfactant solution as needed and physically disperse clumped particles.
8) Dry the sample and handle as directed in ASTM C 430.

The Department will reject any bituminous adhesive if it meets all requirements of this Specification but fails in actual use.

D. Materials Warranty

General Provisions 101 through 150.

LUMPKIN COUNTY

SUPPLEMENTAL SPECIFICATION

Section 893—Miscellaneous Planting Materials

Delete Section 893 and substitute the following:

893.1 General Description

This section includes the requirements for miscellaneous planting materials, such as the following:

- Plant topsoil
- Mulch
- Vines, shrubs, trees, and miscellaneous plants
- Inoculants
- Porous material
- Prepared plant topsoil
- Tree paint
- Stakes
- Organic soil additives
- Erosion Control Compost
- Engineered Topsoil

893.1.01 Related References

A. Specifications

Section 814—Soil Base Materials

Section 822—Emulsified Asphalt

B. Referenced Documents

ANSI Z60.1 American Standard for Nursery Stock

"Standardized Plant Names"

"Method of Test for Moisture Content of Hay or Straw" United States Department of Agriculture and the United States Composting Council, "Test Methods for the Examination of Composting and Compost" (TMECC).

GDT 41

893.1.02 Submittals

For erosion control compost submit a notarized certification that includes the following:

- The feedstock by percentage in the final compost product.
- A statement that the compost meets federal and state health and safety regulations.
- A statement that the composting process has met time and temperature requirements.
- A copy of the lab analysis, less than four months old, performed by a Seal of Testing Assurance certified lab verifying that the compost meets the physical requirements specified.

When requested by the Engineer, one Solvita Compost Maturity Test kit (six tests) for every 1000 yd^3 (765 m^3) of compost supplied shall be provided. The Solvita Compost Maturity Test kit is available from:

Woods End Research Laboratory Inc.
Box 297
Mt. Vernon, Maine 04352
1-800-0451-0337
email: info@woodsend.org
or approved equal.

893.2 Materials

893.2.01 Plant Topsoil

A. Requirements

1. Use plant topsoil with the following characteristics:
   - Obtained from well-drained, arable land, but not from fields where tobacco grew in the last three years, or where Johnson grass or kudzu is present.
   - Friable, loamy soil with between 2 and 30 percent organic matter. Determine the percentage by measuring the loss on ignition of oven-dried samples ignited at 1,200 °F (650 °C).
   - Reasonably free from subsoil, heavy or stiff clay, coarse sand, and other deleterious substances.
   - Has no toxic amounts of acid or alkaline elements.
   - Can sustain healthy plant life.
   - Meets the grade requirements of Subsection 814.2.01.A.8.
2. The Department reserves the right to inspect all plant topsoil during the planting period. The Department will reject any material that does not meet the Specifications.
3. Do not use frozen, muddy, or nonfriable topsoil.
4. Before delivering any topsoil to the job site, clear stones larger than 2 in (50 mm) size and roots, sticks, brush, coarse litter, and other substances that would interfere with mixing, planting, and maintenance.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery
   a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.
   b. Send an invoice with each shipment that shows the sizes and varieties of material included.
2. Packaging
   Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.02 Mulch

A. Requirements

1. Use mulch materials from two groups:
   a. Grassing and Erosion Control: Threshed rye, oat or wheat straw; or Bermuda grass hay
   b. Vine, Shrub, Tree, and Miscellaneous Plant Plantings: Pine straw, pine bark, or hardwood mulch (see 893.2.07.A.2 for pine bark and hardwood mulch).
2. Use mulch materials from either group that meet the following requirements:
   - Are accepted by the Engineer.
   - Can be distributed uniformly when properly loosened

- Produce the desired results
- Meet the moisture requirements specified herein
- Contain no excessive amounts of noxious weed seeds

3. Noxious Weed Seeds

   Do not use hay or straw mulch material that has matured seeds from noxious weeds or other species that would harm surrounding farmland.

4. Moisture Content

   Ensure that the mulch material is reasonably dry.

5. Erosion Control Compost

   Use compost that meets the requirements in Table 1. Erosion Control Compost can be 100% compost or a blend of no more than 50% wood chips by volume.

   a. Wood Chips shall be fresh or partially composted wood chips less than or equal to 3 in (75 mm) in length with 100% passing a 2 in (50 mm) sieve and less than 10% passing a 1 in (25 mm) sieve. Wood chips shall not contain any visible refuse or other physical contaminants, material toxic to plant growth, or over 5% sand, silt, clay or rock material.

   b. Produce General Use Compost by aerobic (biological) decomposition of organic matter. Compost feedstock may include, but is not limited to, leaves and yard trimmings, Class A biosolids, food scraps, food processing residuals, manure or other agricultural residuals, forest residues, bark, and paper. Compost shall not contain any visible refuse or other physical contaminants, material toxic to plant growth, or over 5% sand, silt, clay or rock material. Mixed municipal solid waste compost and Class B biosolids, as defined in the United States Environmental Protection Agency Code of Federal Regulations (USEPA, CFR), Title 40, Part 503 are unacceptable. Ensure Compost meets all applicable USEPA, CFR, Title 40, Part 503 Standards for Class A biosolids and the following requirements:

Table 1 – Physical Requirements for Compost

Test	Requirements	Test Method
Organic Matter Content	25-100% (dry mass)	TMECC 05.07-A
Particle Size	100% passing 2 in (50 mm) sieve 50-70% retained on 3/8 in (9.5 mm) sieve	TMECC 02.02-B
Soluble Salts	5.0 max. * dS/m	TMECC 04.10-A
Fecal Coliform	Pass	TMECC 07.01-B
pH	5.5 – 8.5 pH	TMECC 04.11-A
Stability	8 or below	TMECC 05.08-B,
Maturity	greater than 80%	TMECC 05.05-A
Heavy Metals	Pass	TMECC 04.06 and TMECC 04.13-B

*A soluble salt content up to 10.0 dS/m for compost used in Compost Manufactured Topsoil will be acceptable.

NOTE: All physical requirements are in accordance with the United States Department of Agriculture and the United States Composting Council, "Test Methods for the Examination of Composting and Compost" (TMECC). Organic Matter Content and Particle Size requirements are in accordance with AASHTO R51-13.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. If the material feels damp, the Department will use GDT 41 to test for moisture content.
2. To pass, materials shall have a moisture content of 12 percent or less.

D. Materials Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

   a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

   b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

   Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.03 Vines, Shrubs, Trees, and Miscellaneous Plants

A. Requirements

1. Use stock that meets the requirements of all State and Federal Laws for inspection of plant diseases and infestation.
2. Use nursery grown and collected plant materials that meet all regulations of the States of their origin and destination, and that meet Federal regulations governing interstate movement of nursery stock.
3. Use stock that is true to name and variety and is of first class quality with well developed tops and vigorous, healthy root systems.

NOTE: Use plant names according to the edition of "Standardized Plant Names" in effect at the time of Invitation For Bids.

4. Use only nursery-grown stock that conforms to ANSI Z60.1 American Standard for Nursery Stock.
   a. The Department will not accept plants and/or trees that are severely cut back or pruned to conform to contract size requirements.
   b. The Department will reject trees and shrubs that are undersized, have poorly developed tops or root systems, or are infected with disease or infested with insects.
5. Certification

   Furnish all certificates of disease and infestation inspection, a list of plant materials purchased, and a complete list of nurseries from which each plant was grown.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will inspect plants at the nursery whenever necessary.

1. Inspect and grade living plants for type, size, and quality according to ANSI Z60.1 American Standard for Nursery Stock.
2. Even if the Department accepts materials after a test at the source, the Department may inspect the stock during planting and reject any that does not meet specification.
3. The Department will reject any of the following:
   - Stock damaged during digging, loading, transporting, planting, and transplanting
   - Broken or loose balls or balls of less diameter than that specified
   - Large canopy shade trees without a single dominant central leader
4. Replace rejected stock at your own expense.
5. Dispose of rejected stock to the satisfaction of the Engineer.

D. Materials Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.04 Inoculants

A. Requirements

1. Use a pure culture of nitrogen-fixing bacteria for an inoculant to treat seeds. Select an inoculant for maximum vitality and ability to transform nitrogen from the air into soluble nitrates and deposit them into the soil.
2. Use only purebred cultures less than one year old.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Engineer will review acceptable cultures.

D. Material Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.05 Prepared Plant Topsoil

A. Requirements

1. Use prepared plant topsoil made from plant topsoil, organic soil additive, commercial fertilizer, and lime, as described in Subsection 893.2.07.B.
2. Base any volume for peat moss used as an organic soil additive on the compressed bale.
3. For loose peat, double the volume.

B. Fabrication

1. Make prepared plant topsoil from the following:
   - Four parts plant topsoil, Subsection 893.2.01
   - At least one part organic soil additive, by volume, Subsection 893.2.07.
   - A commercial fertilizer, grade 6-12-12, at the rate of 3 lb/yd³ (1.8 kg/m³)
   - Lime at the rate of 5 lb/yd³ (3 kg/m³)
2. Base the above volumes on naturally compacted, undisturbed topsoil.

C. Acceptance

The Department will accept the materials based upon their compliance with this specification.

D. Material Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.06 Stakes

A. Requirements

1. Use wood stakes as indicated in the Specifications or shown on the Plans. Use the stakes for vine, shrub, tree, and miscellaneous plantings.
2. Saw wood stakes from either oak or gum. Use only stakes that are number two common or better, either rough or dressed.

B. Fabrication

1. Cut the stakes from sound, solid, undecayed wood, without unsound knots.
2. Shape stakes to within 1/4 in (6 mm) for all dimensions.
3. Taper all stakes at one end.

C. Acceptance

The Department will reject any stake that does not meet the following test:

1 Draw a line from the center of the top to the center of the butt of each stake.

2 Ensure that the line stays within the body of the stake and is not more than 1 in (25 mm) from the geometric center of the stake.

D. Materials Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.07 Organic Soil Additives

A. Requirements

Use four types of organic additives: peat moss, pine bark, compost, and hardwood mulch.

1. Peat Moss

Use peat moss that meets the following requirements:

- Be granulated sphagnum virtually free from woody substances, consisting of at least 75 percent partially decomposed stems and leaves of sphagnum
- Be essentially brown in color
- Be free of sticks, stones, and mineral matter
- Be in an air-dry condition
- Shows an acid reaction of 3.5 pH to 5.5 pH
- Meets State and Federal regulations

2. Pine Bark

Use pine bark that meets the following requirements:

- Be obtained from disease-free wood, 100 percent of which is 9 in² (5625 mm²) or less in area, and 50 percent is more than 1 in² (625 mm²) in area.

- Contain no noxious weed seeds, soil, sawdust or any substance toxic to plant growth
- Be at least two years old

3. Compost

   Use compost that meets the following requirements:

   - Be organic materials that have undergone biological decomposition
   - Be disinfected using composting or similar technologies
   - Be stabilized so it is beneficial to plant growth
   - Be mature, dark brown or black in color and have minimal odors
   - Contain no human pathogens
   - Fall within a pH range of 5 to 8

   Provide to the Department a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis.

4. Hardwood Mulch

   Use hardwood mulch that meets the following requirements:

   - Derived from disease-free deciduous trees
   - Particle size of less than 1 in (25 mm) diameter and less than 3 in (75 mm) in length. Hardwood mulch shall complete two composting cycles of 140 ^{o}F (60 ^{o}C) so that all viable weed seeds are destroyed and no further decomposition due to nitrification will occur
   - Free from toxic levels of acidity and alkalinity
   - Derived from sources other than cypress trees

   Provide test results stating that the ingredients meet Federal, State, and local requirements for priority pollutant limits and do not contain levels of any chemicals that are harmful to plants or humans.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the materials based upon their compliance with this specification.

D. Material Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

   a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

   b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

   Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

893.2.08 Engineered Topsoil

A. Requirements

1. Use an engineered mixture meeting the requirements herein. Do not use a mixture containing deleterious substances. Obtain the materials from sources approved by the Engineer. Ensure the aggregate retained on No. 10 (2 mm) sieve is of hard, durable particles.
2. Remove particles with diameters greater than 2 in (50 mm) before placing the topsoil. Remove particles with screens or by hand if few oversized pieces exist. Otherwise, crush the oversized pieces to less than 2 in (50 mm) and use them in the proportions shown by the sieve table below.
3. Use 5-10% by dry weight aerobically composted organic matter as topsoil components. The composting pile shall reach temperatures of 55-65^{o}C (131-149^{o}F) for a minimum period of 24 hours to kill pathogens. Obtain composted

organic matter certified as having gone through the prescribed composting process and whose raw materials are from the following approved sources: grass clippings; leaf litter; cafeteria waste (with the exception of meat products); livestock manure from cows, sheep, goats, pigs, horses, chickens, etc.; and brewery waste. All components shall be free of pesticides and herbicides.

4. Use 90-95% by dry weight inorganic topsoil components with the following properties:

Sieve Size	Percent Passing by Weight
Passing 2 in (50 mm)	100
Passing 1-1/2 in (37.5 mm)	95-100
Passing No. 10 (2 mm) sieve	75-90
Passing No. 40 (425 µm)	50-70
Passing No. 60 (250 µm) sieve	30-60
Passing No. 200 (75 µm) sieve	10-25
Clay size (< 2 µm)	3-10

5. Ensure material passing the No. 10 (2 mm) sieve meets the following requirements:

Property	Value
Liquid Limit (LL)	25 or less
Plasticity Index (PI)	10 or less
Volume change, max. percent	12
Maximum dry density, lb/ft³ (kg/m³)*	105 (1680)
*by standard proctor	

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The engineered topsoil to be used shall be sampled and tested as directed by the Engineer according to the following properties:

Test	Method
Soil gradation	GDT 4
Volume change	GDT 6
Maximum density	GDT 7
Liquid Limit	AASHTO T 89
Plastic Limit and Plasticity Index	AASHTO T 90

The engineered topsoil shall be resampled and retested as directed by the Engineer when 150 tons of use on a project is reached; and it shall be resampled and retested for every 150 tons of use thereafter.

D. Materials Warranty

General Provisions 101 through 150.

E. Delivery and Packaging

1. Delivery

   a. Give the Engineer at least 24 hours notice before delivering any stock to the job site.

b. Send an invoice with each shipment that shows the sizes and varieties of material included.

2. Packaging

   Pack stock for shipment to properly protect against drying, freezing, breaking, or other injury.

LUMPKIN COUNTY

STANDARD SPECIFICATION

Section 927 –Luminaires, LED

927.1 General Description

This section includes the requirements for LED (Light Emitting Diode) luminaires.

927.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

Section 680 – Highway Lighting

Section 681 – Lighting Standards and Luminaires

B. Referenced Specifications

ANSI/IES Types (specified on Plans)

927.2 Materials

Use luminaires that are complete, including driver, LED, surge protection device (SPD), and associated hardware and wiring.

927.2.01 Luminaires

A. Requirements

Ensure that LED luminaires meet the following requirements:

- Certified by Nationally Recognized Testing Laboratories (NRTL) as defined by the U.S. Department of Labor. The testing laboratory must be listed by OSHA in its scope of recognition for the applicable tests being conducted as required by this specification. A list of recognized testing labs for products sold in the United States may be found on the U.S. Department of Labor's web site:
- Certification mark by a NRTL as being in compliance with UL 1598 and suitable for use in wet locations.
- Ensure LED light source(s) and driver(s) are RoHS compliant.
- International Electrotechnical Commission (IEC) 529 Ingress Protection (IP) rating of IP66 or greater is used for all luminaires.
- Comply with Electro Magnetic Interference (EMI) requirements as defined by FCC 47 Sub Part 15; CISPR15, CISPR22 Class A (120Vmin).
- Perform testing according to the Illuminating Engineering Society of North America (IESNA) LM-79 and LM-80
    a. Supply testing and data in compliance with LM-79 from a National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.
- Listed and labeled in accordance with the U.S. Department of Energy Lighting Facts Program:http://www.lightingfacts.com/default.aspx?cp=content/products

B. Housing

Ensure the housing for LED luminaires meet the following requirements:

- Provide aluminum housing.
    a. If die cast aluminum housing is provided, use Aluminum alloy that is A360 or A380 compliant.
- Anodized and/or painted or powder coated with a minimum thickness of 2.0 mil to increase corrosion resistance. Finish color to be gray unless otherwise specified on plans. Luminaire finish to be tested to withstand a 2000-hour salt spray test in accordance with ASTM B117.
- All hardware on the exterior of the housing including cover and latch to be stainless steel, zinc or steel with zinc alloy electroplate and chromate top coat.
- Ensure roadway luminaires are easy to open when properly mounted or when sitting on its top side when placed on the ground without the use of tools. Ensure underpass luminaires are vandal-proof.
- Have readily accessible internal parts.
- Provisions for a slip fitter type mounting on nominal 2" (2-3/8" OD) pipe brackets.
- Slip fitter mount is to allow a minimum 4 inches of the pole bracket to be inserted in the luminaire mounting assembly.
    a. The mounting assembly is to permit any necessary adjustment to orient the luminaire with the roadway for proper light distribution.
- Ensure the total weight of luminaire(s) and accessories do not exceed the load capacity of the pole and arm.
- Compliant with American National Standard (ANSI) IEEE C136.31 Roadway Lighting Equipment - Luminaire Vibration for both normal applications and bridge and overpass applications.
- Provide luminaires with a flat area on the top of the housing to allow a level to be used for proper orientation of the Luminaire, or supply luminaires with an integral bubble level.
- Provide luminaires that are capable of accommodating a photo-electric control receptacle (PECR). When used (see plans for applicability) the PECR to be rotatable up to 359 degrees. Housing is to provide 360 degree stop to prevent the internal twisting of PECR wire assemblies resulting in potential electrical short.
- Designed to allow water shedding.
- Passive cooling method to be employed with no energized or moving components to manage thermal output of LED light engine and power supply.

C. Electrical Requirements

Ensure that LED luminaires meet the following electrical requirements:

- Electronic components capable of fully operating in a temperature range -40ºC to +50ºC (-40º F to 122°F).
- Have an integral power supply.
- Equipped with a power supply that operates within the voltage range specified in the plans.
- Equipped with a power supply that has a power factor of .90 or greater at full load.
- Equipped with a power supply that has total harmonic distortion of 20% or less at full load.
- Provide lumen output sufficient to meet the lighting criteria as specified in the Plans.
- Equipped with an isolated power supply output.
- Equipped with a power supply that has overheat protection.
- Equipped with a power supply that is self-limited short circuit protected and over load protected.
- Equipped with a power supply that is terminated with quick disconnect wire harnesses for easy maintenance. Wire nut termination is not acceptable.

- Equipped with a terminal block for terminating pole wiring to the luminaire. The terminal block is to be a 3 station, tunnel lug terminal board that accommodates up to #8 AWG wire.
- Have a life rating on all electrical components of 100,000 hours or greater when operating at a continuous 25°C ambient.
- Electrical components protected per ANSI/IEEE standard C62.45; test waveform is to be as described in ANSI/IEEE C62.41.2; and type Category C environments as defined in ANSI/IEEE C62.41.1
- Equipped with a UL-labeled, 3-wire surge protective device (SPD) that provides common and differential mode protection and an inductive filter circuit that reduces the amount of energy passed through to the electronics during a surge event. SPD to be thermally fused and have failure mode such that luminaire is off if SPD fails. SPD to provide IEEE/ANSI C62.41 Category C (10kV/5kA) level of protection for the entire luminaire.

D. LED Performance Requirements

Ensure that LED luminaires meet the following performance requirements:

- Fully operate in a temperature range -40ºC to +50ºC (-40º F to 122°F).
- No more than a 15% reduction in LED's lumen output due to the operating temperature of the luminaire, compared to the LED's lumen output when it is operating at 25°C.
- Deliver an average 80% of initial delivered lumens after 100,000 hours of operation when operated at 25°C.
- A minimum rated life of 70,000 hours when operated at 25° C (77° F).
- Luminaire efficacy of a minimum of 70 lumens/watt.
- Meet the Chromaticity requirements as follows:
  a. The colors conform to the following color regions based on the 1931 CIE chromaticity diagram.
     1) Color Temperature: 4000K (3710-4260K)
     2) Color Rendering Index (CRI): greater than or equal to 60
  b. Intensity and Chromaticity as stated above must be confirmed by an independent test lab.

E. Optical Requirements

Ensure that LED luminaires meet the following optical requirements:

- Luminaire housing is to be a completely sealed optical system with a (IEC) (IP) rating of 66 or greater.
- The light distribution pattern at the road surface is to have an evenly dispersed appearance.
- Provide the IES pattern as identified on the Plans.

F. Fabrication

General Provisions 101 through 150.

G. Acceptance

1. General Provisions 101 through 150.
2. Each Luminaire to be evaluated by the Department for proper operation under a 30 day burn-in period after installation. If any failures are found in the first 30 days after installation, the Luminaire is to be replaced at no cost to the Department and be evaluated for another 30 days from the time of its installation. The system is acceptable when all luminaires pass the 30 day burn-in period with no failures.

H. Materials Warranty

1. General Provisions 101 through 150.

2. The entire Luminaire assembly including material, finish, workmanship, power supply, LED modules and lumen maintenance is to have a minimum of five (5) year warranty from the date of installation. On-site replacement includes transportation, removal and installation of new products. Finish warranty includes deterioration such as blistering, cracking, peeling, chalking or fading.

Submitted: March 31, 2021

LUMPKIN COUNTY

SPECIAL PROVISION

Project Name: SR 60 BUS & OAK GROVE ROAD ROUNDABOUT
LUMPKIN COUNTY

Section 999 – Detectable Warning Surface

Add the following:

999.1 General Description

This work consists of constructing the detectable warning surfaces within the splitter islands of the roundabout.

999.1.01 Related References

A. Standard Specifications

Section 441 – Miscellaneous Concrete

999.2 Construction Requirements

999.2.01 Personnel

General Provisions 101 through 150.

999.2.02 Equipment

General Provisions 101 through 150.

999.2.03 Preparation

General Provisions 101 through 150.

999.2.04 Fabrication

General Provisions 101 through 150.

999.2.05 Construction

Install the detectable warning surfaces as shown in the construction plans after the splitter islands have been constructed. The installation will adhere to GA Detail A4 and Section 441 of the Standard Specifications.

999.2.06 Quality Acceptance

General Provisions 101 through 150.

999.2.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

999.3 Measurement

Detectable warning surfaces are measured for payment per square foot installed and accepted. The detectable warning surfaces used on the wheel chair ramps will be measured separately.

999.3.01 Limits

General Provisions 101 through 150.

999.4 Payment

The specified detectable warning surfaces are paid for at the contract unit square foot. Payment is full compensation for:

- Furnishing the material and labor
- Installation of the detectable warning surfaces
- Any other incidentals such as cleaning or prep work that may be needed prior to installation

Payment is made under:

Item No. 999	Detectable Warning Surface	Per square foot

999.4.01 Adjustments

General Provisions 101 through 150.