SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.01: Section Requirements

A. Summary: This Section includes water system piping for potable-water service outside the building.

1. This Section does not include tapping of utility company water main by utility company and charging directly to Owner.

B. Comply with NSF 14 for plastic potable-water-service piping.

C. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

PART 2 - PRODUCTS

2.01: Pipe and Fittings

A. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

1. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

2. Brazing Filler Metals: AWS A5.8, BCuP Series.

3. Solder Filler Metal: ASTM B 32, lead-free type with 0.20 percent maximum lead content.

B. PVC Plastic Pipe: ASTM D 1785, Schedule 80.

1. PVC Socket Fittings: Schedule 80, ASTM D 2467.

2. Solvent Cement for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

C. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket and spigot end.

1. Comply with UL 1285 for fire-service mains.

2. PVC Fabricated Fittings: AWWA C900, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

2.02: Valves

A. Nonrising-Stem, Resilient-Seated Gate Valves, NPS 3 and Larger: AWWA C509, gray and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and mechanical-joint ends.

B. Nonrising-Stem Gate Valves: UL 262, FMG-approved iron body and bonnet with flange for

indicator post, bronze seating material, and inside screw; 175-psig working pressure, and flanged end connections.

C. Valve Boxes: NEMA 4X Fiberglass box with top section and cover with lettering "WATER"; bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

D. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

E. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.03: Specialties

A. Backflow Prevention Devices: ASSE standard backflow preventers, bronze body, 150-psig working pressure, of size indicated for maximum flow rate and maximum pressure loss indicated.

B. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

PART 3 - EXECUTION

3.01: Installation

A. Connect water system piping and water-supply source and building water-distribution and fire-protection systems at the building wall in locations and pipe sizes indicated.

B. Install restrained joints for buried piping within 60 inches of building. Use restrained-joint pipe and fittings, thrust blocks, anchors, tie rods and clamps, and other supports at vertical and horizontal offsets.

C. Install fittings for changes in direction and branch connections.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.

E. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.

G. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.

H. Install continuous underground detectable warning tape during backfilling of trench for underground water- service piping. Locate below finished grade, directly over piping.

I. Clean and disinfect water distribution piping according to authorities having jurisdiction.

*****End of Section 33 05 00*****

SECTION 33 11 00 – WATER UTILITY DISTRIBUTION PIPING

PART 1 – GENERAL

1.01: Section Includes

A. Buried pipe and piping.

B. Valves.

C. Fire Hydrants.

D. Thrust blocks and harnessing.

E. Field quality control.

F. Test.

G. System disinfection.

H. Connections to existing mains.

1.02: Related Sections

A. Trenching, bedding and backfilling for pipelines are specified in Section 33 05 28 – Trenching and Backfilling for Utilities.

B. Coordinate the work of this Section with the work of Section 22 11 01 – Water Distribution.

1.03: Measurement and Payment

A. General: Measurement and payment for the water distribution system will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for the water distribution system indicated in the Bid Section of the Bid Form.

B. Lump Sum: If the bid schedule indicated a lump sum for the water distribution system, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 Price and Payment Procedures, Article 1.03.

C. Unit price: If the Bid Schedule indicated a unit price for the water distribution system, the unit-price method of measurement and payment will be as follows:

1. Measurement:

a. Water distribution system will be measured for payment by the linear foot of pipe, installed in place, tested and disinfected, for each type and size of pipe, along the centerline of the pipe with deductions made for manholes or other structures, measured from the inside face of each structure.

b. Utility structures will be measured separately for payment as specified in Section

33 05 16, Utility Structures.

c. Pipe fittings, valves, joints, pipe bedding, collar taps, and cutting of pipe will not be measured separately for payment, and all costs in connection therewith will be considered as included in the linear foot measurement for pipe.

d. Fire hydrants will be measured for payment by the individual unit (each), installed in place and acceptably tested.

e. Support of trench excavation, maintenance, support of existing utility facilities, grading, excavation and backfill, cast-in-place concrete, and incidental work pertaining to the installation of pipe will not be measured separately for payment, but will be considered as included in the linear foot measurement for pipe.

2. Payment: The water distribution system will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1.

1.04: References

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

1.	ASTM A126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
2.	ASTM A197	Specification for Cupola Malleable Iron
3.	ASTM A307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
4.	ASTM D1784	Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
5.	ASTM D1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
6.	ASTM D2466	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
7.	ASTM D2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
8.	ASTM D2855	Practice for Making Solvent-Cemented Joints, with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
9.	ASTM D3139	Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
10.	ASTM F439	Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fitting, Schedule 80
11.	ASTM F477	Specification for Elastomeric Seal (Gaskets) for Joining Plastic Pipe

B. American Water Works Association (AWWA):

1.	AWWA C500	Gate Valve, 3 through 48 inches NPS – for Water and Sewage System

2.	AWWA C503	Standard for Wet-Barrel Fire Hydrants
3.	AWWA C504	Rubber Seated Butterfly Valve
4.	AWWA C508	Swing-Check Valves for Water Works Service, 2 inches through 24 inches NPS
5.	AWWA C606	Grooved and Shouldered Type Joints
6.	ANSI/AWWA C651	Standard for Disinfecting Water Mains
7.	ANSI/AWWA C900	Specification for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch for Water Distribution

C. Water Utility District Standards: Note that all work shall be performed and completed in accordance with the jurisdictional water utility district's standard drawings and specifications. The Contractor shall be responsible for obtaining all such standards and for compliance with such standards as applicable.

D. Underwriters Laboratories Inc. (UL):

1. UL 246 Hydrant for Fire-Protection Service

1.05: Submittals

A. Refer to Section 01 33 00 – Submittal Procedures, and Section 01 33 23 – Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Submit respective manufacturer's product data for manufactured materials and equipment, including all valves and fire hydrants.

C. Submit Shop Drawings showing piping layout and pipe, valves, hydrants, and locations of tie-ins, buttresses, and thrust blocks.

1.06: Submittals for Closeout

A. General: Refer to Section 01 77 00 – Closeout Procedures, and Section 01 78 23 – Operation and Maintenance Data, for Submittal requirements and procedures.

B. Record Drawings: Record actual location of piping mains, valves, connections, and invert elevations for review.

1.07: Site Conditions

A. Excavations in which products will be buried shall be dry.

B. Coordinate the installation of the water supply system with the jurisdictional water utility owner.

C. The jurisdictional water utility district shall provide water services to the water meters' points of connection for station facilities and landscape irrigation systems, and modifications to existing water mains, as indicated on the Contract Drawings. The Contractor shall be responsible for making all

such arrangements.

PART 2 – PRODUCTS

2.01: Buried Pipe and Fittings

A. Requirements: Provide the types, sizes, and configurations of pipe, fittings, and miscellaneous materials and installation accessories as indicated.

B. PVC Pipe and Fittings, 3 inches and Smaller:

1. Pipe: Polyvinyl chloride (PVC), ASTM D1785, Schedule 40 or 80, as indicated, Type I, Grade

2. Fittings: ASTM D2466, socket weld, same material and schedule as pipe, or meeting requirements of ASTM F439, as applicable.

3. Joints: Socket welded with PVC solvent cement conforming to ASTM D2564 and ASTM D2855.

C. PVC Pipe and Fittings, 4inches or Larger:

1. Pipe: AWWA C900, Class 200, polyvinyl chloride (PVC) water pipe with bell and spigot ends and flexible ring joints.

2. Fittings: ASTM D1784, Type 1, Grade 1, polyvinyl chloride (PVC) fittings, Class 200, or meeting requirements of ASTM F439, as applicable.

3. Joints: ASTM D3139, gasketed bell joints with ASTM F477 gaskets.

2.02: Valves

A. Gate Valves:

1. Gate Valves up to 2-1/2 inches: 150 pound bronze body, non-rising stem, single wedge, threaded connection.

2. Gate Valve 3 inches and Over: AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, mechanical joint ends with type gland and serration's designed for plastic pipe service.

B. Pressure Reducing Valves: All bronze construction, spring-loaded, single-seated, suitable for tight shutoff under dead-end conditions. Provide with renewable composition seat discs, nylon inserted diaphragm, bolted spring chamber, and threaded connection.

C. Backflow Preventer: Provide a device that is approved by the jurisdictional water utility company. As a minimum, the backflow preventer shall be a reduced pressure principle assembly with two rising-stem gate shut-off valves, two resilient seat ball-valve test cocks, two check valves replaceable resilient disks and seat with relief valve with replaceable seat. Backflow preventer shall be suitable for 175 psig operating pressure and 140 degrees F operating temperature, and shall be of bronze construction with bronze construction with bronze internal parts and stainless steel springs, screwed inlet and outlet for 2-inch and smaller sizes, and cast iron, epoxy-coated construction with 150 pound flanged inlet and outlet for 3-inch and larger sizes.

2.03: Fire Hydrants

A. Provide fire hydrants and related appurtenances as indicated. Fire hydrants shall comply with the requirements of the jurisdictional water utility district, as applicable.

B. Fire hydrants shall meet the requirements of AWWA C502 and UL 246, as applicable, and shall be wet barrel type, as a minimum, with a minimum of two discharge nozzles of size(s) required by the jurisdictional authority.

2.04: Concrete for Thrust Blocks

A. Provide Class 3000, 1-inch aggregate, concrete for all thrust blocks, as specified in Section 03 05 15 – Portland Cement Concrete, with reinforcement where indicated.

2.05: Miscellaneous Metal

A. Tie Rods: Stainless steel, Type 316, threaded ANSI standard, bolt threaded on both ends. Minimum 1/2 –inch diameter for 4-inch pipe, 5/8-inch minimum diameter for 6-inch and 8-inch diameter pipe, and 3/4-inch minimum diameter for 12-inch and larger.

B. Rod Couplings: Malleable iron, ASTM A197, turnbuckle design, female threaded to mate with tie rods, 5/8-inch and ¾-inch sizes to mate with both rods and mechanical joint bolts.

C. Pipe Clamps: For sizes 4 inches and larger, provide with malleable iron rod sockets. Provide washers in lieu of rod sockets where authorized, conforming with ASTM A126, Class A, cast iron. Bolts and bolting shall conform with ASTM A307.

PART 3 – EXECUTION

3.01: Maintaining Water Services

A. Maintain water service and conduct operations at times selected to minimize the duration and inconvenience of service interruption.

B. At least 24 hours prior to the required cutting or abandoning of an existing water main, notify the jurisdictional water utility owner, and obtain approval of the schedule. Actual cutting or abandoning of an existing water main shall be performed by the Contractor after receiving approval from the owner of the facility.

C. Keep existing water mains parallel to new water mains in service until new water mains are ready for service.

D. Where the existing water main or service is to be cut for connection to new piping, the work shall be performed by the Contractor. Initial work operations shall include the test-pitting of all points of connection (tie-in) to ensure the true location of existing linework.

E. Water valves in service shall be operated only by personnel of the jurisdictional water utility owner.

F. Except as specified otherwise herein, construction methods shall be in accordance with the applicable provisions of the jurisdictional water utility owner's standard drawings and specifications.

3.02: Installation

A. Installation Requirements:

1. Excavate pipe trench in accordance with Section 33 05 28 - Trenching and Backfilling for Utilities. Hand trim bottom of trench to approximately 6 inches below invert of pipe.

2. Top of pipe to finished grade shall be 30 inches unless otherwise indicated or approved by the Engineer.

3. Place sand bedding material, meeting the requirements of Section 33 05 28 - Trenching and Backfilling for Utilities, at trench bottom, level in one continuous layer not exceeding 8 inches in compacted depth. Compact bedding to 95 percent relative density.

4. Backfill around sides and to 6 inches above pipe with cover fill tamped in place and compacted to 95 percent relative density.

5. Test pipe distribution system and place tracer wire on top of pipe as specified herein prior to covering pipe. Backfill trench in accordance with Section 33 05 28 – Trenching and Backfilling for Utilities.

6. Maintain optimum moisture content of bedding material to attain required compaction density.

7. Provide concrete thrust blocks for elbows, tees, valves, and appurtenances of buried piping. Thrust blocks shall be constructed as indicated and in accordance with AWWA requirements.

8. Install piping true to line and grade, supported and guided to assure alignment under all conditions.

9. Install pipe to allow for expansion and contraction without stressing pipe or joints.

10. Install unions at each connection to valves, both sides of each valve.

11. Make change in line with fittings. Do not spring joints to effect change of direction.

12. Do not field cut pipe unless necessary. Make such necessary cuts by means of equipment designed for the purpose, ensuring a smooth and square end.

13. For connection to existing pipe, provide pipe with suitable ends or adapters, after verification of size and type of existing pipe.

14. Install tie rods and pipe clamps at every joint fitting and valve.

B. Valves:

1. Install valves in accordance with the valve manufacturer's installation instructions.

2. Where valves are provided by the jurisdictional water utility owner, provide suitable access for performance of such work.

3. Where necessary, alter the typical valve manhole to suit actual conditions. Any alterations in valve manholes shall be operable from the street level. All operator nuts shall be plumb to the valve manholes.

4. Set valve on solid bearing.

5. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Fire Hydrants:

1. Provide fire hydrant installations as indicated. Installation shall conform with requirements of the jurisdictional fire department and the water utility owner's standard drawings and specifications.

2. Provide necessary appurtenances and accessories as required to complete the installation.

3. Paint hydrants in accordance with applicable requirements of Section 09 91 00, Painting.

4. Set hydrants plumb, locate pumper nozzle perpendicular to and facing roadway.

D. Thrust Blocks and Harnessing

1. Provide for counteracting thrust caused by static and dynamic forces, including water hammer at bends, tees, reducers, valves, and dead-ends by installing harnessing as indicated or required. For other methods, submit details for approval of the jurisdictional water utility owner prior to use.

2. Provide concrete thrust blocks as indicated where harnessing is not practicable.

E. Water Service Connections: Provide water service connections, where necessary, in accordance with the California Plumbing Code, the installation instructions of the service pipe and fittings manufacturer, and the utility company requirements with reduced pressure back-flow preventer and water meter with by-pass valves.

F. Acceptance Requirements: After installation of pipes, ends of pipes shall be either capped or plugged. No piping shall be buried before being inspected and tested.

3.03: Field Quality Control

A. Refer to Section 01 43 00 – Quality Assurance, for requirements.

B. Compaction testing of related earthwork shall be performed in accordance with applicable requirements of Section 31 00 00 – Earthwork.

C. If tests indicate work does not meet specified requirements, remove such work, replace, and retest at no additional cost to the District.

3.04: Tests

A. Protection from Flooding: Provide positive measures to protect exposed, installed pipe and compacted pipe bedding from flooding during testing.

B. Notice of Testing:

1. Give 48 hours notice of intention of testing to the jurisdictional water utility owner, which will furnish, install, and operate pumps, gages, meters, and individual pipe connections to test openings.

2. Designate largest sections feasible for testing and sterilizing. Testing and sterilizing operations shall be performed by the Contractor; at Contractor's expense.

C. Testing Requirements:

1. General:

a. For hydrostatic tests, provide approved caps and plugs in sections to be tested, and remove them after testing.

b. Prevent leakage in pipes and fittings at openings. Temporarily block plugged and capped ends to prevent displacement.

c. Install the water source connection for testing the isolated section. The Engineer may permit the use of a tap that will be furnished and installed by utility owner.

d. Provide labor and materials required for leakage testing, including excavation for installation and removal of pumps, gages, meters, and water source connections.

e. Where leakage exceeds the water utility company's standards, perform necessary corrective measures.

f. Remove and replace defective pipes, joints, fittings, valves, and other appurtenances. Reset such items if displaced.

g. Perform hydrostatic tests in accordance with the jurisdictional water utility district's requirements. All such tests shall be witnessed by the jurisdictional water utility district's representative. The Contractor shall be responsible for making all such arrangements.

h. Remove and replace defective pipe, joints, fittings, valves, and other appurtenances. Reset such items if displaced.

D. Testing and Flushing of Potable Water System: Test the potable water system hydrostatically in sections to a pressure of at least 150 psi for not less than 15 minutes, witnessed by the Engineer. Pressure test pipe before burial. Repair leaks and retest the system until the system is leak free. Use testing instruments calibrated by a qualified laboratory in accordance with Section 01 45 00 - Quality Control. Test sequence shall be as follows:

1. Lines shall be fully flushed.

2. Lines shall be hydrostatically tested.

3. Lines shall be fully flushed.

4. Lines shall be fully disinfected.

3.05: System Disinfection

A. Before final acceptance of the water supply system, each section of the new line shall be disinfected in accordance with ANSI/AWWA C651. One of the following sources of disinfectant shall be used:

1. Mixture of water and chlorine gas;

2. Direct application of chlorine;

3. Mixture of water and calcium hypochlorite; or

4. Mixture of water and calcium chloride.

B. Before disinfecting, flush the line thoroughly to remove dirt and extraneous materials. Clean each section of the line between valves independently.

C. Retain the disinfectant solution in the pipe for at least 24 hours. Following this sterilization period, the residual chlorine content at the ends of the section and at other representative points shall be not less than five parts per million. Then, the line shall be drained and thoroughly flushed with water until the residual chlorine content is similar to that obtained from the existing water distribution system.

D. Take water samples and test in accordance with ANSI/AWWA C651.

3.06: Connections to Existing Mains

A. Following testing and sterilization, new water distribution lines shall be connected to existing mains as indicated. Each connection shall be made at a time and in a manner that will result in the least interruption of service.

B. All connections involving shut down of jurisdictional water utility's existing facilities shall be made under the immediate supervision of the jurisdictional water utility district. No member of the Contractor's forces may operate any valve controlling the flow of water in the water utility's existing system.

C. The Contractor shall provide tie-ins to the existing system at a time that is convenient to jurisdictional water utility district, which may be in the evenings and on weekends.

*****End of Section 33 11 00*****

SECTION 33 31 00 – SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.01: Summary

A. Section Includes:

1. Sanitary sewer pipe and fittings.
2. Underground pipe markers.
3. Connection to existing manholes.
4. Wye branches and tees.
5. Sanitary Laterals.

B. Related Sections:

1. Section 31 23 17 - Trenching: Excavation, bedding and backfill requirements for trenching required by this section.
2. Section 33 01 32 - Sewer and Manhole Testing.: Pressure, infiltration, and deflection tests.
3. Section 33 05 14 – Utility Manholes and Structures: Concrete manholes, frames and lids for sanitary sewer.

1.02: References

A. ASTM International:

1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
5. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
6. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
7. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
8. ASTM C1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.

9. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

10. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

11. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

12. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

13. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

14. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

15. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

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

B. American Water Works Association:

1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. Through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.

2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile- Iron Pressure Pipe and Fittings.

3. AWWA C153 - American National Standard for Ductile-Iron Compact Fittings for Water Service.

4. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

C. SCDOT Standard Specifications:

1. Standard Specifications for Highway Construction, 2007, published by the South Carolina Department of Transportation.

1.03: Submittals

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Permits: Submit copies of construction permits obtained for this Work.

C. Product Data: Submit catalog cuts and other pertinent data indicating proposed materials, accessories, details, and construction information.

D. Submit reports indicating field tests made and results obtained.

E. Manufacturer's Installation Instructions:

1. Indicate special procedures required to install Products specified.

2. Submit detailed description of procedures for connecting new sewer to existing sewer line and directional drilling, or pipe jacking installation.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04: Closeout Submittals

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05: Quality Assurance

A. Perform Work in accordance with SCDOT Standard Specifications.

B. Maintain one copy of document on site.

1.06: Qualifications

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum 3 years documented experience.

1.07: Delivery, Storage, and Handling

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves in shipping containers with labeling in place.

C. Block individual and stockpiled pipe lengths to prevent moving.

D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

E. Do not place pipe flat on ground. Cradle to prevent point stress.

F. Store UV sensitive materials out of direct sunlight.

1.08: Field Measurements

A. Verify field measurements and elevations are as indicated.

1.09: Coordination

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work with local sewerage authority. Convene pre-installation meeting minimum of one week prior to starting Work of this Section.

C. Notify affected utility companies minimum of 72 hours prior to construction.

PART 2 - PRODUCTS

2.01: Sanitary Sewer Pipe and Fittings

A. PVC Flexible Joint Plastic Pipe: ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber ring sealed gasket joint.

1. Pipe Class: SDR 35.

2. Fittings: PVC conforming to pipe specifications.

3. Joints: ASTM-D 3212, elastomeric gaskets.

B. Ductile Iron Gravity Sewer Pipe: ANSI/AWWA C150, bell and spigot ends. Conforming to ASTM A-377.

1. Pipe Class: 8” through 12” pressure class 350 psi., 14” and larger pressure class 250 psi.

2. Fittings: Ductile iron, AWWA C110. Compact fittings, AWWA C153.

3. Joints: Rubber gaskets per AWWA C111.

2.02: Flexible Pipe Boot For Manhole Pipe Entrances

A. Furnish materials in accordance with authority having jurisdiction.

B. Flexible Pipe Boot: ASTM C923, ethylene propylene rubber (EPDM), Series 300 stainless steel clamp and stainless steel hardware.

2.03: Underground Pipe Markers

A. Plastic Ribbon Tape: Brightly colored green continuously printed with "SANITARY SEWER" in large letters, minimum 6 inches wide by 4 mils thick.

2.04: Manholes

A. Manholes: As specified in Section 33 05 14 and indicated on Drawings; cover inscribed with “SANITARY SEWER”.

2.05: Concrete and Grout

A. Concrete: Class A Concrete conforming to Division 500 of the SCDOT Standard Specifications.

1. Compressive strength of 3,000 psi at 28 days.

2. Air entrained.

3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.

4. Maximum slump of 3.5 inch for vibrated concrete and 4 inch for non-vibrated concrete.

5. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

B. Grout: Non-shrink, non-metallic in accordance with Divisions 500 and 700 of SCDOT Standard Specifications with a compressive strength of at least 5,000 psi at 3 days.

2.06: Bedding and Cover Materials

A. General: Conform to Section 31 23 17 for bedding and backfill around and on top of pipe.

B. Bedding for Rigid Pipe (DIP and RCP): Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SP, SP-SM or SP-SC.

C. Bedding for Flexible Pipe (PVC, ABS): Clean course aggregate Gradation No. 57 conforming to Division 700 of the SCDOT Standard Specifications.

PART 3 - EXECUTION

3.01: Examination

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing sanitary sewer utility main size, location, and inverts are as indicated on Drawings.

3.02: Excavation and Bedding

A. Excavate pipe trench in accordance with Section 31 23 17.

B. Excavate to lines and grades shown on Drawings or required to accommodate installation of encasement.

C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

D. Provide sheeting and shoring in accordance with Section 31 23 17.

E. Place bedding material at trench bottom, level continuous layer not exceeding 8-inch compacted depth; compact to 95 percent per Section 31 23 17.

3.03: Installation – Pipe

A. Install in accordance with manufactures instructions and as indicated on Drawings.

B. Install plastic pipe, fittings, and accessories in accordance with ASTM D2321.

C. Install VCP, fittings, and accessories in accordance with ASTM C12.

D. Install RCP, fittings, and accessories in accordance with ASTM C1479.

E. Install CIP and DIP, fittings, and accessories in accordance with applicable portions of AWWA C600.

F. Seal joints watertight.

G. Lay pipe to slope gradients indicated on Drawings with maximum variation from indicated slope of 1/8 inch in 10 feet. Begin at downstream end and progress upstream.

H. Ensure entire pipe is supported by bedding.

I. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Drawings or by Engineer.

J. Keep pipe and fittings clean until work is completed and accepted by Engineer. Cap open ends during periods of work stoppage.

K. Lay bell and spigot pipe with bells upstream.

L. Connect pipe to existing sewer system as indicated on Drawings at existing manhole or using doghouse manhole connection per Section 33 05 14.

M. Place haunching material, rod, and tamp per Section 31 23 17 to eliminate voids.

N. Install underground marking tape continuously 18 inches above pipe line.

3.04: Connection to Existing Manhole

A. Core drill existing manhole to clean opening. Using pneumatic hammers, chipping guns, and sledge hammers is not permitted.

B. Install watertight neoprene gasket and seal with non-shrink concrete grout.

C. Concrete encase new sewer pipe minimum of 24 inches to nearest pipe joint. Use epoxy binder between new and existing concrete.

D. Prevent construction debris from entering existing sewer line when making connection.

3.05: Manhole Installation

A. Install manholes in accordance with Section 33 05 14.

3.06: Installation – Wye Branches and Tees

A. Install wye branches or pipe tees at locations indicated on Drawings concurrent with pipe laying operations. Use standard fittings of same material and joint type as sewer main.

B. Maintain minimum 5 feet separation distance between wye connection and manhole.

C. Use saddle wye or tee with stainless steel clamps for taps into existing piping. Mount saddles with solvent cement or gasket and secure with metal bands. Layout holes with template and cut holes with mechanical cutter.

3.07: Installation – Sanitary Laterals

A. Construct laterals from wye branch to terminal point at right-of-way or as indicated on Drawings.

B. Where depth of main pipeline warrants, construct riser type laterals from wye branch.

C. Maintain 3-foot minimum depth of cover over pipe.

D. Maintain minimum 5-foot separation distance between laterals.

E. Install watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral. Install temporary marker stake extending from end of lateral to 24 inches above finished grade. Paint top 6 inches of stake with fluorescent orange paint.

3.08: Backfilling

A. Backfill around sides and to top of pipe in accordance with Section 31 23 17.

B. Maintain optimum moisture content of backfill material to attain required compaction density.

3.09: Field Quality Control

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request inspection prior to and immediately after placing bedding.

C. Perform test on sanitary sewage system in accordance with Section 33 01 34 and local code. Perform the following tests:

1. Gravity Sewer Testing:

    a. Low pressure air test.

    b. Infiltration test.

2. Deflection Testing of Plastic Piping.

3. Manhole Testing: Vacuum Test.

4. Notify Engineer and Owner 72 hours in advance of test and have witness test.

D. Compaction Testing: In accordance with Section 31 23 17.

E. When tests indicate Work does not meet specified requirements, remove work, replace, and retest.

3.10: Protection of Finished Work

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

*****End of Section 31 00 00*****

SECTION 33 41 00 – STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01: Summary

A. Section Includes:

1. Storm drainage piping.
2. Accessories.
3. Concrete Collars.

B. Related Sections:

1. Section 31 23 17 - Trenching: Excavation, bedding, and backfill requirements for trenching required by this Section.
2. Section 33 01 32 - Sewer and Manhole Testing: Pressure, infiltration, and deflection tests.
3. Section 33 05 14 - Utility Manholes and Structures: Concrete and masonry manholes, catch basins, inlets, junction boxes, and frames and grates for storm drains.

1.02: References

A. American Association of State Highway and Transportation Officials

1. AASHTO M36 – Corrugated Steel Pipe, Metallic Coated, for Sewers and Drains.
2. AASHTO M190 – Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches.
3. AASHTO M196 – Corrugated Aluminum Pipe for Sewers and Drains.
4. AASHTO M294 – Corrugated Polyethylene Pipe

B. ASTM International:

1. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
2. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
3. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
4. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low- Pressure Air Test Method.
5. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
6. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast

Concrete Pipe Sewer Lines.

7. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

8. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

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

C. LDOTD Standard Specifications:

1. Standard Specifications for Roads and Bridges, 2006, published by the Louisiana Department of Transportation.

1.03: Submittals

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for pipe and pipe accessories.

C. Manufacturer's Installation Instructions: Submit special procedures required to install products specified.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04: Closeout Submittals

A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05: Quality Assurance

A. Perform Work in accordance with LDOTD Standard Specification.

B. Maintain one copy of document on site.

1.06: Qualifications

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum 5 years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum 5 years documented experience.

1.07: Delivery, Storage, and Handling

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

D. Do not place pipe flat on ground. Cradle to prevent point stress.

E. Store UV sensitive materials out of direct sunlight.

1.08: Coordination

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with local storm drain authority.

C. Notify affected utility companies minimum of 72 hours prior to construction.

PART 2 - PRODUCTS

2.01: Storm Drainage Piping

A. Reinforced Concrete Pipe (RCP): ASTM C76, bell and spigot or tongue and groove ends.

1. Pipe Class: Class III with Wall Type B, or as otherwise specified on Drawings.

2. Fittings: Reinforced concrete.

3. Joints: ASTM C443, rubber compression gasket.

B. HDPE Corrugated Polyethylene Pipe: AASHTO M294, Type S or Type D.

1. Fittings: PVC conforming to pipe specifications.

2. Joints: ASTM F477, elastomeric gaskets.

C. Corrugated Metal Pipe (CMP):

1. Steel Pipe: ASSHTO M36.

2. Aluminum Pipe: AASHTO M196.

3. Fittings: Corrugated Steel or Aluminum to match pipe.

4. Joints: Corrugated coupling bands, galvanized steel or aluminum to match pipe, minimum 10 inches wide; connected with two neoprene "O" ring gaskets per and two galvanized steel bolts.

D. Bituminous Coated CMP: AASHTO M 190, Coated inside and out with 0.050 inch thick bituminous coating.

2.02: Manholes and Structures

A. Manholes: As specified in Section 33 05 14 and indicated on Drawings; covers inscribed with "STORM SEWER."

B. Catch Basins, Inlets and Junction Boxes: Conform to Section 33 05 14 and as indicated on Drawings.

2.03: Concrete and Grout

A. Concrete: Class A Concrete conforming to Divisions 500 and 700 of the LDOTD Standard Specifications.

1. Compressive strength of 3,000 psi at 28 days.

2. Air entrained.

3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.

4. Maximum slump of 3.5 inch for vibrated concrete and 4 inch for non-vibrated concrete.

5. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

B. Grout: Non-shrink, non-metallic in accordance with Divisions 500 and 700 of LDOTD Standard Specifications with a compressive strength of at least 5,000 psi at 3 days.

2.04: Bedding and Cover Materials

A. General: Conform to Section 31 23 17 for bedding and backfill around and on top of pipe.

B. Bedding for Rigid Pipe (RCP): Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SP, SP-SM or SP-SC.

C. Bedding for Flexible Pipe (HDPE and CMP): Clean course aggregate Gradation No. 57 conforming to Division 700 of the LDOTD Standard Specifications.

PART 3 - EXECUTION

3.01: Examination

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02: Preparation

A. Excavate pipe trench in accordance with Section 31 23 17.

B. Excavate to lines and grades shown on Drawings or required to accommodate installation of encasement.

C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

D. Provide sheeting and shoring in accordance with Section 31 23 17.

E. Place bedding material at trench bottom, level continuous layer not exceeding 8-inch compacted depth; compact to 95 percent per Section 31 23 17.

F. Maintain optimum moisture content of bedding material to attain required compaction density.

3.03: Installation – Pipe

A. Install in accordance with manufactures instructions and as indicated on Drawings.

B. Install plastic pipe, fittings, and accessories in accordance with ASTM D2321.

C. Seal joints watertight.

D. Lay pipe to slope gradients indicated on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet. Begin at downstream end and progress upstream.

E. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Drawings or by Engineer.

F. Keep pipe and fittings clean until work is completed and accepted by Engineer. Cap open ends during periods of work stoppage.

G. Lay bell and spigot pipe with bells upstream.

H. Connect pipe to existing sewer system as indicated on Drawings at existing manhole or using doghouse manhole connection per Section 33 05 14.

I. Install underground marking tape continuously 12 inches above pipe line.

J. Connect to subdrainage tile system piping. Refer to Section 33 46 00.

K. Install site storm drainage system piping to 5 feet of building and plug.

3.04: Installation – Connection to Existing Structures

A. Core drill existing manhole to clean opening. Do not use pneumatic hammers, chipping guns, and sledge hammers.

B. Install watertight neoprene gasket and seal with non-shrink concrete grout.

C. Concrete encase new sewer pipe minimum of 24 inches to nearest pipe joint. Use epoxy binder between new and existing concrete.

D. Prevent construction debris from entering existing sewer line when making connection.

3.05: Installation – Manholes, Catch Basins and Cleanouts

A. Install manholes in accordance with Section 33 05 14.

B. Form bottom of excavation clean and smooth to correct elevation.

C. Form and place cast-in-place concrete base pad or pre-cast concrete base with provision for storm sewer pipe end sections.

D. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

E. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.

F. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.06: Field Quality Control

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request inspection prior to and immediately after placing bedding.

C. Perform tests on storm drain system in accordance with Section 33 01 34 and local code. Perform the following tests:

1. Gravity Sewer Testing:

a. Low Pressure Air Test.

b. Infiltration Test.

2. Deflection Testing of Plastic Piping.

3. Manhole Testing: Vacuum Test.

4. Notify Engineer 72 hours in advance of test and have witness test.

D. Soil Compaction Testing: In accordance with Section 31 23 17.

E. When tests indicate Work does not meet specified requirements, remove work, replace, and retest.

3.07: Protection of Finished Work

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.

2. Repair or replace pipe that is damaged or displaced from construction operations.

*****End of Section 31 00 00*****