

STANDARD SPECIFICATIONS
SECTION 02533
PRESSURE SEWER SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Section includes requirements to provide permanent grinder pump pressure sewer system, piping, and appurtenances.

1.2 REQUIREMENTS FOR MANUFACTURERS AND SUPPLIERS BEFORE DELIVERY

- A. Sample, inspect, test, and retest pipe, valves, fittings, and joint material following Section 02530 and ASTM Standards referenced herein.
 - 1. Engineer may inspect sample and test pressure pipe and fittings as specified herein.
 - a. If any specimen fails to meet requirements set forth herein and in referenced ASTM Standards, Engineer will randomly select and test another section of pipe or fitting from same production run of pipe or fitting originally tested.
 - b. Failure of additional samples to meet referenced requirements shall be cause for rejection of remainder of that production run.
- B. Perform quality assurance for precast structures following Section 03400.

1.3 SUBMITTALS

- A. Submit following Section 01330.
 - 1. Pipe manufacturer's installation instructions:
 - a. Polyvinyl chloride (PVC) pipe with solvent cement and push-on joints.
 - b. High Density Polyethylene (HDPE) pipe with butt fusion, socket fusion, saddle fusion and electrofusion jointing techniques and flange joints.
 - c. Repair or rejection of HDPE pipe and fittings.
 - 2. Fittings: Letter from pipe manufacturer giving brand name of compatible fittings offered with pipe.
 - 3. Lined Precast Concrete Manholes:
 - a. Recommended installation procedures.
 - b. Recommended repair methods for defects and damage from manufacturer furnishing product.
 - 1) Repairs by manufacturer using specially trained and certified personnel.
 - 2) Proceed only after approval of Engineer and in his presence.
 - 4. Provide Engineer with method to be used for tie-in to existing pressure sewer.
- B. Submit following Section 01450 before delivery of materials.
 - 1. Certificates of Compliance or Materials Checklist Furnished by the Commission:

- a. Pipe.
- b. Valves.
- c. Fittings.
- d. PVC pipe solvent cements.
- e. Other Contractor furnished material under this Section.
- f. Include Commission Contract Number, job location, Contractor's name, types, classes, and strengths of pipe and pipe manufacturer's name.

1.4 HANDLING AND STORAGE

- A. Handling: Unload material carefully.
- B. Storage:
 1. Place or store as close to final point of placement as practical.
 2. Provide adequate means of protecting material from ultra violet degradation and discoloration following manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pipe and Fittings.
 1. General.
 - a. Pipe of given size and material by same manufacturer.
 - b. Clearly mark each pipe length and fitting as required herein.
 - c. Produced by extrusion process and homogeneous throughout, free from cracks, holes, foreign inclusions or other defects and uniform in color.
 - d. Do not use pipe with blisters, bubbles, cuts, or scrapes on inside or outside surfaces, which damage wall thickness, or other imperfections which impair performance or life of pipe.
 - e. The Commission will furnish:
 - 1) Corporation stops.
 2. PVC.
 - a. General.
 - 1) Produced from resins following ASTM D1784 for Class 12454-B, Type 1, Grade 1, and PVC 1120.
 - 2) Bearing NSF seal of approval.
 - 3) Markings.
 - a) Legibly mark pipe at intervals of 5 feet maximum with manufacturer's name or trademark, pipe size, PVC cell classification, appropriate legend (PVC SDR-21 ASTM D2241), manufacturer's lot number, date of manufacture, and point of origin.
 - b) Pipe not marked as specified herein will be rejected.
 - 4) Do not use pipe and fittings manufactured more than 1 year before date of

- work-site installation.
- b. Solvent cemented joint, pipe and fittings: Pressure sewer piping 1-1/4-inch diameter following Contract Documents, unless noted otherwise.
 - 1) Approved pipe manufacturers:
 - a) Charlotte Pipe and Foundry Co.
 - b) Ipex, Inc.
 - c) Or Equal.
 - 2) Pipe: ASTM D2241, SDR-21 for working pressure of 200 psi or ASTM D1785, Schedule 40.
 - a) Bell-end pipe: ASTM D2672.
 - 3) Solvent cement: ASTM D2564.
 - 4) 1-1/4-inch PVC couplings for jointing spigot end pipe:
 - a) Extruded type having beveled entrance.
 - b) Minimum pressure rating of 200 psi for continuous operation at 73.4 degrees F.
 - 5) Elbows, tees, reducers, and adapters: Minimum pressure rating of 200 psi for continuous operation at 73.4 degrees F.
 - 6) 1-1/4-inch adaptors: PVC with socket for solvent-cement joint end connections and female threaded-end connection.
 - 7) Fittings: Manufactured or approved by pipe manufacturer for use and compatible with their pipe.
 - c. Gasketed joint, pipe and fittings: Integral bell-end PVC pipe or spigot-end double-bell coupling PVC pipe, 1-1/2-inch through 4-inch diameter with gasket joints, unless noted otherwise in Contract Documents.
 - 1) Approved manufacturers:
 - a) JM Eagle™.
 - b) PW Eagle.
 - c) Ipex, Inc.
 - d) Diamond Plastics Corporation.
 - e) Cresline Plastic Pipe Co., Inc.
 - 2) Pipe: ASTM D2241, SDR-21 or ASTM D1785, Schedule 40 for working pressure of 200 psi.
 - 3) Joints: ASTM D3139 for push-on joint pipe.
 - 4) End connections: Able to withstand thermal expansion and contraction at each joint and resulting in pressure tight seals up to full rating of pipe.
 - a) Rubber ring gasket: ASTM F477, elastomeric ring suitable for long-term contact with sewage.
 - b) Elastomeric gasket lubricant: Supplied by pipe manufacturer or equal.
 - c) Reference mark: Around entire circumference of pipe on spigot ends indicating depth spigots shall be inserted into bells or couplings.
 - (1) Pipe spigot ends: Beveled to permit proper and easy assembly of joint.
 - 5) Couplings for joining spigot end PVC pipe: Furnished by pipe manufacturer.
 - a) Minimum pressure rating: 200 psi.
 - b) Insertion depth of spigot end of pipe in coupling: Controlled by

- internal PVC mechanical stop in coupling which permits thermal expansion and contraction.
- c) Coupling method: Allow for half expansion or contraction of each pipe section to be taken up at each end of pipe.
 - 6) Fittings:
 - a) Minimum pressure rating of 200 psi for continuous service at 73.4 degrees F and compatible with pipe used.
 - b) Manufactured or approved by pipe manufacturer for use and compatible with their pipe.
 - d. Threaded pipe and fittings: When required herein, shown on Drawings, or Standard Details.
 - 1) Pipe with threaded end connections: Schedule 80 PVC pipe meeting requirements of ASTM D1785 and D2464, approved manufacturers:
 - a) Charlotte Pipe and Foundry Company (1 and 1-1/4 inch only).
 - b) Or Equal.
 - 2) Thread sealant: Type, which gives watertight seal and permits ease of disassembly. Use Teflon, Fluoroseal, or similar compounds based on tetra fluorethylene resins.
 - 3) Fittings: Manufactured or approved by pipe manufacturer for use and compatibility with pipe.
 - e. Flanged joint, pipe, and fittings: When required herein, as shown on Drawings, or Standard Details.
 - 1) Flat face flange: secured by solvent welding and meeting requirements of ANSI B/16.1 Class 125.
 - 2) Fittings: Manufactured or approved by pipe manufacturer for use and compatibility with their pipe.
 - 3) Flange bolts, nuts, gaskets, and washers: See Section 02510.
 - 3. HDPE Pipe: ASTM D3035 or ASTM F714.
 - a. General.
 - 1) Material:
 - a) Material Designation PE3408/PE4710
 - b) ASTM D3350 cell classification PE445474C or PE445574C.
 - c) Minimum thermal stability: ASTM D3350.
 - d) Manufactured in accordance with the following :
 - (1) 1-1/4 inch through 3 inch Iron Pipe Size (IPS) diameters following AWWA C901 and ASTM D3035.
 - (2) 4 inch DIPS diameter following AWWA C906 and ASTM F714.
 - 2) Markings:
 - a) Legibly marked in green to identify as sewer pipe at intervals of 5 feet maximum with manufacturer's name, trademark, pipe size (nominal size and OD base IPS), PE 3408, SDR-11 appropriate legend such as HDPE, ASTM D3035 or ASTM F714, date of manufacture, and point of origin.
 - b) Pipe not marked as specified herein will be rejected.
 - b. Pipe and fittings, approved manufacturers:
 - 1) CP Chem, Division of Chevron Phillips Chemical Company, LP.

- 2) Rinker Materials Poly Pipe Division.
- 3) Or Equal.
- c. Pipes: Standard Dimension Ratio (SDR) of 11 with corresponding operating pressure of 160 psi, unless noted otherwise.
- d. Fittings: ASTM D3261, use injected molded fittings with ends suitable for Butt fusion unless otherwise specified.
 - 1) Where fittings are installed in trench, socket fusion, saddle/sidewall fusion and electrofusion jointing technique fittings may be used instead of Butt fusion fittings, when approved by Engineer.
 - 2) Socket fusion fittings: ASTM D2683.
 - 3) Saddle/sidewall fusion fittings: ASTM F905.
 - 4) Socket and saddle/sidewall fusion fitting supplied by manufacturer of pipe.
 - 5) Electrofusion fittings supplied by Central Plastics Company or equal.
 - 6) Pressure rating of fittings same as adjacent pipe.
- e. Pipe joints:
 - 1) Fusion techniques: Unless otherwise noted, use butt fusion joints between pipes or fittings.
 - a) Where jointing of pipe is required in trench, electrofusion or socket fusion jointing techniques may be used instead of butt fusion jointing technique, when approved by Engineer.
 - b) Make electrofusion couplings containing integral heating by computer controlled automatic electrofusion system, which controls time, temperature, and jointing pressure for consistent joint.
 - (1) Couplings rated for same pressure as pipe.
 - (a) Build-in identification feature to automatically set fusion times and to include current monitoring feature.
 - (b) Manufactured by Central Plastics Company or equal.
 - 2) Flange joints: ANSI B/16.1, Class 125 flat face, when required herein or as shown on Drawings or Standard Details.
 - a) Pressure rating same as adjacent pipe.
 - b) Flange joint connection to HDPE pipe:
 - (1) HDPE flange adapter, supplied by same manufacturer of pipe with butt fusion jointing technique, ductile iron backup rings and bolts, gaskets, nuts and washers, see Section 02510 or,
 - (2) HDPE by Flange end fitting, 1 piece assembly, with 1 end of HDPE pipe with butt fusion jointing technique and other end being steel or brass flange as manufactured by Industrial Pipe Fittings, Inc. or equal.
 - (a) Coat steel flanges internally and externally with fusion bonded epoxy.
 - 3) No threaded or solvent welded/glued HDPE joints permitted.

B. Valves.

1. Ball Valves:

- a. 1-1/4 inch through 4 inch diameter: PVC, true union ball valve.
 - 1) Application: Pressure sewer service connection service valves and flushing

- connection isolation valves; see Drawings and Standard Details.
- 2) Rating and Configuration:
 - a) Water tight shut off and non-shock pressure rating at 73 degrees F not less than 150 psi.
 - b) Valve size same as pipeline nominal size.
 - c) Furnish with socket type end connectors:
 - (1) For solvent welding to PVC pipelines or
 - (2) Solvent welded to Class 150 (ANSI B16.5) PVC flanges for connection to mating flanges on HDPE pipelines.
 - 3) Port:
 - a) Round through body and ball.
 - b) Diameter within plus 0.100 inches and minus 0.230 inches of nominal valve size.
 - 4) PVC Components: Valve body, ball, stem seat carriers, and union nuts of molded PVC following ASTM D-1784, Cell Classification 12454.
 - 5) Seats: Teflon® PTFE (polytetrafluoroethylene).
 - 6) Stem seals and O-rings: Viton® (fluoroelastomer).
 - 7) Operation:
 - a) Quarter turn with positive stops.
 - b) Furnish with manufacturers' optional T-style operating nut of minimum 5/8 inch height by 2 inch length by 1/2 inch to 5/8 inch width.
 - c) Operating nut of anodized aluminum or solid PVC retained with factory installed stainless steel screw threaded into valve stem.
 - 8) Approved models and manufacturers:
 - a) Duo-Bloc 21 by Asahi-America with specified optional construction.
 - b. End Connections: See Drawings or Standard Details with adaptors compatible with PVC or HDPE pipe.
2. Two inch Diameter Sewage Air/Vacuum Valves and Air-Release Valve.
 - a. General:
 - 1) Locations: See Drawings and Standard Details.
 - 2) Air/Vacuum and Air-Release Valves: Same manufacturer for all valves.
 - 3) Usage: Recommended for service up to 150 psi.
 - 4) Bodies and covers: Gray iron meeting requirements of ASTM A126 Class B and of short body pattern for shallow installation.
 - 5) Exterior and internal coating of valves: Fusion bonded epoxy following AWWA C550.
 - 6) Internals:
 - a) Brass: ASTM B61.
 - b) Stainless Steel: ASTM A240.
 - c) Cast iron: ASTM A126.
 - d) Metal internal parts only.
 - 7) Include:
 - a) Complete set of manufacturer-furnished and attached backwash accessories.
 - b) One-half inch diameter inlet with shut-off valve and quick disconnect coupling.

- c) One inch diameter blowoff outlet with shut-off valve.
 - d) Quick disconnect coupling at air release vent outlet.
 - e) Minimum of 5 feet of back flushing hose with quick disconnect couplings.
 - 8) Approved manufacturers:
 - a) APCO, Valve and Primer Corporation Model No. 401C.1.
 - b) Crispin Valve Model S10ASB/S20SB.
 - b. Air/vacuum valve: Two inch diameter NPT inlet and 1-inch diameter NPT vent outlet.
 - 1) Floats: Stainless steel connected to stainless steel float rod and valve that seats against outlet port.
 - 2) Internal baffle: Stainless steel to protect upper part of valve from direct airflow.
 - 3) Seat: BUNA-N material.
 - c. Air release valve: Two inch diameter NPT inlet and 1/2-inch diameter NPT vent outlet.
 - 1) Float, float guide, and internals: Stainless steel following ASTM A240.
 - 2) Seat: BUNA-N material.
 - d. Minimum orifice diameter as listed below for range of working pressure from 0 to 150 psi.
 - 1) 1/4-inch for Crispin Valve.
 - 2) 1/4 inch for APCO.
 - 3) 3/16-inch for Val-Matic.
3. Corporation Stops:
- a. Rated for minimum service of 150 psi.
 - b. Bronze: ASTM B62.
 - c. Type of Threads.
 - 1) Inlet thread: Standard corporation stop thread following ANSI/AWWA C800.
 - 2) Outlet thread: Standard Male Iron Pipe.
 - d. Approved Manufacturers and Models:
 - 1) A.Y. McDonald Manufacturing Company, Catalog Nos. 3128B.
 - 2) Ford Meter Box Co., Inc. Catalog Nos. FB-400.
 - 3) Mueller Co., Catalog Nos. B-2996.

C. Connection Appurtenances.

1. PVC Pipe.

a. Service Saddles:

- 1) Saddles for PVC: ASTM D2241, SDR 21 and ASTM 1785, Schedule 40 pipe:
 - a) Use for 2 inch and smaller connections to PVC pipe.
 - b) Manufacture saddles with clamps/straps for underground services:
 - (1) Rated for minimum service of 150 psi.
 - (2) Provide full support around circumference of pipe.
 - (3) Do not distort, scratch, or damage pipe when tightened.
 - (4) Contains a thick tapping boss, which has been precision-machined

with full-length threads for a watertight connection that resists pullout.

- (5) Use tapping saddle manufactured specifically for PVC pipe with stainless steel wide band straps, nuts, and washers.
 - (6) Threads: AWWA C800 with standard corporation stop thread.
 - (7) Brass or bronze alloy meeting ASTM B62 or B584 and AWWA C800.
 - (a) Uniform quality, true to pattern, of even grain, sound and smooth, and without cold shuts, swells, scales, blisters, sand holes, cracks or other defects.
 - (b) Surfaces: Smooth with no burnt-on sand.
 - (8) Use watertight gaskets of Buna-N rubber meeting ASTM D2000 or nitrile around tap hole.
- c) Approved Manufacturers and Models:
- (1) Ford Meter Box Co., Inc. Style 202BS Double Strap.
 - (2) Mueller Company, Catalog BR2S Double Strap.
 - (3) Smith-Blair Inc, Style No. 325 Double Strap.
 - (4) A.Y.McDonald Manufacturing Company, Company No. 3845 and 3891 Double Strap.
- b. Tees: See requirements for PVC pressure pipe and fittings specified herein.
- c. Corporation stops: See Section 02510.
- 1) Threaded inlets and outlets: Compatible with service saddles, service sleeves, piping, and fittings.
- d. Minimum size: 1-1/4-inch diameter, or following Drawings.
2. HDPE Pipe.
- a. Tees: See requirements for HDPE pipe and fittings previously specified herein.
 - b. Flange joints: See requirements for HDPE joints previously specified herein.
 - c. Compression Type Mechanical Couplings: Suitable for joining HDPE to HDPE or HDPE to PVC SDR 21.
 - 1) Factory coat coupling internally and externally with a fusion bonded epoxy.
 - 2) Reinforce HDPE pipe with stiffener in pipe bore.
 - a) Size stiffeners for size and SDR of HDPE pipe being joined.
 - b) Supply feature that prevents stiffener from sliding completely into pipe.
 - c) Size stiffeners for length of mechanical coupling; and not to extend outside of body of mechanical coupling.
 - d) Mark stiffener with pipe diameter and SDR.
 - e) Factory coat stiffeners internally and externally with fusion bonded epoxy.
 - 3) Use either seal only or seal and restraint type coupling. Requirements for type of couplings are specified herein, shown on Drawings or Standard Details.
 - a) Seal Only Type Mechanical Couplings: Long type with middle ring.
 - (1) 12-inches for pipe sizes smaller than 2-inches in diameter.
 - (2) 24-inches for pipe sizes 2-inches and larger in diameter.
 - (3) Approved Manufacturers:

- (a) Dresser Piping Specialties, Style 40.
 - (b) Smith-Blair, Inc.
 - (c) Or equal.
 - (4) Restraint of HDPE pipe at mechanical couplings: See Standard Details.
 - b) Seal and Restraint Type Mechanical Couplings Manufactured by:
 - (1) Dresser Piping Specialties, Style 90 for HDPE by HDPE, 2-inches and smaller, and Style 711 for HDPE by HDPE, 4-inches and smaller diameter pipes.
 - (2) Smith-Blair, Inc., style Maxi-Grip EZ for HDPE by HDPE or style Maxi Grip U-series Class I for HDPE by PVC, 4-inches and smaller diameter pipes.
 - (3) Or equal.
 - d. Transition Fittings: One piece assembly.
 - 1) One end being HDPE pipe with butt fusion jointing technique.
 - 2) Other end being either steel or brass pipe threaded suitable for connecting PVC Schedule 80 pipe, threaded fittings or threaded valves.
 - a) Approved Manufacturers:
 - (1) Central Plastics Company.
 - (2) Industrial Pipe Fittings, Inc.
 - (3) Or equal.
 - 3) Pressure rating: Same as adjacent pipe.
 - 4) Factory coat steel pipe internally and externally with fusion bonded epoxy.
- D. Pipe Embedment Material and Trench Backfill for Pipe and Structures: See Standard Details and Section 02315.
- E. Wood: For Blocking and Valve Box Installation: See Standard Details.
- F. Precast Structures: See Section 03400.
- G. Liner for Manholes: See Section 03400.
- H. Gravity Sewer Construction: See Section 02530.
- I. Concrete: See Section 03300.
- J. Flexible Gasket Connectors for Inserting Pipe through Manhole Walls: See Section 03400.
- K. Detectable Warning Tape (for trench method installation only): See Section 02315.
- L. Modified Cast Iron Valve Boxes: See Section 02510.
- M. Manhole Frames and Covers: See Section 02530.

N. Valve Covers: See Standard Details and Section 02510.

PART 3 EXECUTION

3.1 INSTALLING PIPE

A. Trench Method: PVC and HDPE Pipe.

1. General

- a. Inspect exterior and interior of each pipe and fitting for damage and discoloration.
- b. Trench excavation, backfill, and test pits: Follow Section 02315 and specified herein.
 - 1) Before pipe installation:
 - a) Dig test pits to determine size, type, and exact location of existing pipe to which proposed pipe will connect.
 - b) Excavate sufficient trench in advance and test pit existing underground utilities/structures, whether shown on Drawings or visually identified in field, to:
 - (1) Verify actual locations.
 - (2) Make reasonable changes in line and grade to resolve conflicts, as approved by Engineer.
 - c) Furnish Engineer location and elevation information when previously unknown or different underground utilities/structures are encountered.
 - 2) Perform additional work made necessary because of failure to take above precautions at no cost to the Commission.
- c. Pipe Embedment Material.
 - 1) Place embedment material so that pipe is uniformly supported along its length.
 - 2) Do not drop pipe and fittings into trench.
 - 3) Do not drag pipe in manner which causes scratching of pipe surface.
 - 4) Excessive gouging of pipe surface will be cause for rejection.
- d. Placement.
 - 1) Clean each pipe and fitting of foreign substances before placing in trench and keep clean during jointing process.
 - a) Should foreign substances, harmful materials, or damaged pipe be observed in previously installed pipe, cease work until foreign material is removed or damaged pipe removed and replaced.
 - 2) Close open ends of pipe and fittings with a watertight seal during periods when work is not in progress.
 - 3) Provide thrust blocks at bends, tees, caps, and plugs following Standard Details.
- e. Pipe Embedment and Trench Backfill Materials.
 - 1) Provide pipe embedment material around pipe following Standard Details and Section 02315.
 - 2) Backfill remainder of trench with material following Section 02315.

- f. Install detectable warning tape following Standard Details and Section 02315.
- g. Perform required pressure test as specified herein.
- 2. PVC Pipe and Fittings.
 - a. Follow pipe manufacturer's installation instructions for field cutting and beveling PVC pipe and minimum radius of curvature of various sizes of pipe for installing curved sections of pipe.
 - b. Place solvent cement joint pipe in trench as specified herein and following manufacturer's recommendations.
 - c. Provide thrust blocks at bends, tees, caps, and plugs following Standard Details.
 - d. Remove and replace damaged pipe and fittings at no cost to the Commission.
- 3. HDPE Pipe and Fittings.
 - a. Follow pipe manufacturer's installation instructions for field cutting and fusion jointing techniques for HDPE pipe.
 - 1) Include acceptable size and shape of fusion bead; and minimum radius of curvature of various sizes of pipe for installing curved sections of pipe.
 - b. Do not install flanges, fittings, or valves in curved section.
 - c. Use butt fusion jointing technique for connections between pipe sections or fittings, unless otherwise noted herein.
 - d. Provide thrust blocks at seal only mechanical couplings and connections to transition manholes following Standard Details and at other fittings where indicated on Drawings.
 - e. Inspect and evaluate following manufacturer's installation instructions.
 - f. Remove and replace damaged HDPE pipe and fittings at no cost to the Commission.

- B. HDPE Pipe by Horizontal Directional Drilling (HDD): Following Section 02446 and specified herein.

3.2 JOINTS

- A. PVC Pipe and Fittings.
 - 1. Solvent-Cement Joints: Prepare PVC pipe and fittings and make solvent-cement joints following ASTM D2855 and manufacturer's installation instructions for conditions encountered.
 - a. Test fit each joint dry before applying solvent cement.
 - b. If dry fit of any fitting or coupling is loose, reject pipe and fitting as faulty due to improper size.
 - c. Prior to pressurizing or testing, allow joints to cure.
 - 2. Push-on Joints: Make push-on joints following manufacturer's instructions.
 - a. Insert spigot ends into bells and couplings to depth marked on pipe.
 - b. If pipe is cut, mark depth reference around entire circumference of pipe.
 - c. Use only lubricant supplied by pipe manufacturer and following manufacturer's directions.
 - 3. Threaded Joints: Used only where shown on Drawing and Standard Details.
 - a. Use threaded pipe only where threaded adapters and fittings are required to make a complete fitting assembly.

- b. Do not force threaded fitting when tightening.
 - 1) Tighten 1/4 to 1/2 turn past hand-tight using smooth jaw wrench.
- 4. Flanged Joints: See Section 02510.

B. HDPE Pipe and Fittings.

- 1. Fusion Jointing Techniques: For joints between pipes and/or fittings use butt fusion jointing technique, unless otherwise noted.
 - a. Where jointing of pipe and/or fittings is required in trench, electrofusion or socket fusion jointing techniques may be used instead of butt fusion jointing techniques, when approved by Engineer.
 - b. Make joints following manufacturer's instructions and ASTM D2657.
- 2. Flange Joints
 - a. Install Flange End Fittings following Section 02510.
 - b. HDPE Flange Adapters:
 - 1) Install flanged end following Section 02510.
 - 2) HDPE end: Butt fusion joint.
 - 3) Tighten flange bolts in alternating diametric pattern and torque in increments following manufacturer's recommendation.
 - a) Re-torque flange joints one or more hours after completion.
 - c. Mechanical Couplings:
 - 1) Install stiffener in pipe bore as specified herein.
 - 2) When seal only mechanical couplings are used, provide thrust blocks, following Standard Details, Drawings, or as specified herein.
 - 3) Install mechanical couplings following manufacturer's recommended procedure.

3.3 FITTINGS AND VALVES

A. Install fittings and valves following Drawings.

- 1. Inspect and operate valves to ensure proper working order prior to installation.
- 2. Set fittings and valves and join pipe as specified previously herein.
- 3. Install modified cast-iron valve boxes at service valve assemblies and other valve locations following Standard Details.

B. Installation: Set valve boxes at right angles to pipe, centered and plumb over valve operating nut with box cover flush with finished grade or otherwise as directed.

- 1. Support box to maintain nut in position for operation with extended tee wrench operator.
- 2. Backfill and compact under and around valve boxes to ensure no vertical loads are transmitted to valves or pipe.
- 3. Set pipe and fittings in arch openings of lower box section so that no part of box bears on pipe, fittings, and valves.
- 4. Where valve box is located within new subdivision or in area where surface is scheduled to be improved, provide marker stake consisting of a piece of 2 inch by 4 inch lumber a minimum of 5 feet long adjacent to valve box with approximately 3

feet extended above ground.

- a. Paint entire length of marker stake green.

3.4 THRUST BLOCKS

- A. Provide thrust blocks on bends, tees, seal-only type mechanical couplings on HDPE pipe, connections between PVC and HDPE pipes, plugs, and caps following Drawings and Standard Details.
 1. Ensure that entire face of earth against which thrust block will bear is firm bearing, flat, and at proper angle to counteract thrust.

3.5 MANHOLES

- A. Install manholes following Drawings.
- B. Line sewer manhole interior and air/vacuum manhole interior following Section 03400 and Standard Details.
- C. Lined Manholes.
 1. Field install following manufacturer's recommendations.
 2. Visually inspect lining for damage after installation.
 3. Repair damaged surfaces following manufacturer's submitted recommendations.

3.6 CONNECTIONS

- A. Pressure Sewer Service Connections.
 1. General: Install sewer service connections from main line sewer to property lines at elevations following Drawings, Standard Details, or Engineer's direction.
 - a. Install tees, corporation stops, ball valves, saddles, and sleeves where indicated.
 - b. Mark location of vertical sewer service connection pipe at property line with 2-inch by 4-inch lumber, painted green its entire length, placed vertically on property line side from top of riser and extending 2 feet above grade. Place lumber so it does not interfere with blocking.
 - c. Make sewer service connections to new main line pressure sewers by installing tees simultaneous with main line installation.
 - d. Make sewer service connections to new or existing PVC main line gravity sewers using service sleeves, or saddles with clamps for PVC or HDPE.
 - 1) Outlets are to be from 45 degrees to 90 degrees from horizontal following Standard Details and specified herein.
 2. PVC Pressure Sewer Service Connections.
 - a. Connect corporation stops, where required, using service saddles and clamps or service sleeves.
 - 1) Do not tap directly into main line pressure sewer.
 - 2) Support pipe when installing service saddles and clamps, service sleeves, or corporation stops, and when drilling.

- 3) Do not damage pipe and fittings.
 - b. Make sewer service connections to existing main line pressure sewers by installing new saddle or new tee in existing sewer, or by wet tap, following Standard Details and Drawings.
 - 1) Make wet taps by drilling and using service saddles with clamps, service sleeves, and corporation, or other, stops.
 - 2) Perform work so that outlets are horizontal or up to 45 degrees from horizontal.
 - c. Make taps in main line pressure sewer pipe with drilling and tapping equipment specifically manufactured for use with material to be drilled and following manufacturer's recommendations.
 - 1) Perform installation of saddles and tapping of existing mains using only personnel bearing current qualification card issued by the Commission.
 - 2) If shell cutter drills are used, use type that retains pipe coupon so that it is not left in pipe.
 - d. Clean pipe surfaces before placing sleeves and saddles.
 - e. When connecting to existing HDPE main line pressure sewers, provide electrofusion or socket fusion tee connections and transition fitting specified herein.
3. HDPE Pressure Sewer Service Connection.
- a. When no service tee has been provided on existing HDPE main line pressure sewer, install Electrofusion, Socket fusion, or Saddle/Sidewall fusion tee connections.
 - b. Provide butt fusion tee connection to new HDPE main line pressure sewers, during installation of main line pressure sewer.
 - 1) If approved by Engineer, electrofusion, socket fusion, or saddle/sidewall fusion tee connections, may be used instead of butt fusion tees.
 - c. Corporation stops are not required on HDPE pressure sewer service connection piping.
 - d. Provide electrofusion, socket fusion, or saddle/sidewall fusion tee connection to existing HDPE main line pressure sewers.
 - 1) Clean pipe surfaces before placing service tee connection.
 - e. When connecting to existing PVC main line pressure sewer, provide transition fitting between PVC to HDPE pressure service connection specified herein.
4. New Main Line Connections to Existing Main Line Pressure Sewer.
- a. Connect to existing main line pressure sewer following Drawings.
 - b. Make side connections by installing new tee on existing main line pressure sewer following Standard Details.
 - c. Shutdowns :
 - 1) Notify Engineer with 5 working days of intent to make tie-in to existing sewer.
 - 2) Shutdowns will not be scheduled or performed on day before and day of following holidays:
 - a) New Years Day.
 - b) Good Friday.
 - c) Easter.

- d) Memorial Day.
 - e) Independence Day.
 - f) Labor Day.
 - g) Beginning of Passover.
 - h) Rosh Hashanah.
 - i) Yom Kippur.
 - j) Thanksgiving.
 - k) Hanukkah.
 - l) Christmas.
- d. The Commission will notify customers 24 hours in advance of shutdown.
 - e. Operate valves necessary to shut-off main line pressure sewer and water main and services as needed.
 - 1) Sewage remaining in main line pressure sewer after shut-off must be properly removed and disposed to make proper connection.
 - a) Do not allow sewage on ground surface.
 - b) Clean up sewage spills.
 - c) See Section 02530 for reporting requirements.
 - 2) Make connections in shortest time period with verification of existing material made in advance and with required material, labor, and equipment to complete connection on site before shut-off.
5. Side Connections to Existing Main Line Pressure Sewer.
- a. Existing PVC pressure sewer: Cut and remove length of existing main to accommodate new tee assembly.
 - 1) Use double bell or other couplings approved by Engineer to sleeve new tee in existing main.
 - 2) Install valve in branch end of new tee.
 - 3) Solvent-cement and cure joints from tee to valve before installation in existing main.
 - b. Existing HDPE pressure sewer: Connect with either electrofusion or socket fusion tee connections.
6. Extensions of Existing Main Line Pressure Sewer.
- a. Existing PVC pressure sewer: Cut existing pipe and remove existing cap.
 - 1) PVC pipe: Install compatible pipe socket, sleeve, or coupling and pipe extension.
 - 2) HDPE pipe: Install seal only mechanical coupling and thrust block for transition from PVC to HDPE specified herein.
 - b. Existing HDPE pressure sewer: Cut existing pipe and remove existing cap.
 - 1) HDPE pipe, install butt fusion, electrofusion or socket fusion coupling, restrained and seal type mechanical coupling.
 - 2) PVC pipe, install HDPE socket fusion coupling, thrust block and seal only mechanical coupling for transition from HDPE to PVC specified herein.

3.7 FIELD TESTING

- A. Perform field pressure tests on pressure sewer pipe and connections of 4 inch or smaller diameter.

1. Before Beginning Pressure Test:
 - a. Cure PVC solvent-cement joints and concrete thrust blocks.
 - b. Completely backfill pipe following Section 02315.
 - c. Cap or plug ends of test sections and brace caps to withstand thrust developed under test pressure.
 - d. Slowly fill section of pipe to be tested with water until completely full and air has been expelled.
 - e. HDPE pipe:
 - 1) Before beginning test pressurize allow for diametric expansion or pipe stretching to stabilize.
 - 2) Add water as necessary until pressure stabilizes at test pressure.
 - 3) Protect exposed pipe from temperature fluctuation.
2. Conduct pressure testing with Engineer in attendance and give 72 hours notice to Engineer prior to testing.
3. Water meter for testing: Furnished by the Commission.
4. Provide pressure gage recorder capable of printing a continuous record of pressure test readings (by Dickson Pressure Recorders, Model Numbers PW457 or PR81000) and charts for testing.
5. Test pressure sewer system following Standard Detail W/1.0.
6. Use test pressure minimum of 100 psi at low point of system or follow Drawings.
7. Subject test section to test pressure for minimum of 2 hours. Contractor personnel will operate valves during this portion of test under direction of Engineer.
8. Leakage Allowance.
 - a. Solvent-cement joint or threaded joint and HDPE pipe with fusion jointing techniques for connections: None allowed.
 - b. PVC gasket joints: Calculate maximum allowable leakage for pipe with gasketed joints using following formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

Where:

L = maximum allowable leakage, gallons/hour

N = number of joints in test section;

D = nominal diameter of tested pipe, inches

P = average test pressure, pounds per square inch.

9. Should test results show displacement, damage, or leakage in excess of allowable, repair displacement and delete damage, eliminate leakage, and retest until amount specified conditions are met, at no cost to the Commission.
10. After approval of test by Engineer open all valves.

3.8 ABANDONMENT OF SERVICE CONNECTIONS

- A. Shutdown: Follow New Main Line Connections to Existing Main Line Pressure Sewer instructions specified herein.

- B. If service connection is connected to pressure sewer main, remove connection tee from existing main by cutting main following Standard Details.
- C. Remove service valve assembly, valve box, and check valve.
- D. Cap or plug remaining abandoned pipe.
- E. If service connection is connected to gravity sewer mainline, cut service connection pipe at main and plug.
- F. Remove valve box and check valve.
 - 1. PVC Pipe: Provide watertight cap or plug.
 - 2. HDPE Pipe: Provide butt or socket fusion end cap.

PART 4 MEASUREMENT AND PAYMENT

4.1 PRESSURE SEWER PIPE

- A. Measurement: By linear foot of various sizes and types provided, measured horizontally along centerline of pipe.
 - 1. No deductions will be made for lengths of fittings, connections, valves, flushing connections, and air/vacuum and air release valve manholes.
- B. Payment: At unit price for each size and type of pipe listed in Bid Schedule.
 - 1. Payment includes excavation, backfill, bedding, detectable warning tape or wire, pipe fittings, valves, valve boxes, concrete encasement if required, sleeves, and connections to new and existing facilities for trench method of installing PVC or HDPE pipe: or horizontal directional drilling method of installing HDPE pipe.

4.2 MANHOLES

- A. Measurement: By each, provided complete in place, including frame and cover.
- B. Payment: At unit price for each type listed in Bid Schedule.
 - 1. Payment includes excavation, backfill, and bedding, pipe, valves and fittings, and incidentals following Drawings or Standard Details.

4.3 PRESSURE SEWER SERVICE CONNECTIONS

- A. Measurement: By linear foot of various types and sizes provided, measured horizontally along centerline of pipe from center of main line sewer to end of connection.
 - 1. No deductions will be made for lengths of fittings, connections, or valves.

- B. Payment: At unit price listed for each size and type listed in Bid Schedule.
 - 1. Payment includes excavation, backfill and bedding for trench method of installing PVC or HDPE pipe; or horizontal directional drilling method of installing HDPE pipe; concrete encasement if required; detectable warning tape or wire; pipe; fittings; saddles; sleeves; corporation stops; valves; connections to new and existing facilities; and installation of modified cast-iron valve boxes.

4.4 ABANDONING PRESSURE SEWER SERVICE CONNECTIONS

- A. Measurement: By each service connection abandoned.
- B. Payment: At unit price listed in Bid Schedule.
 - 1. Payment includes excavation, backfill, bedding, providing pipe, fittings, and repair of existing sewer main.

****WSSC****