

SECTION 02610

SEWER PIPE, FITTINGS, MATERIALS AND INSTALLATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the installation, manufacture, transportation, and storage of pipe, pipe joints, and fittings for sanitary sewer pipelines.
- B. This section covers point repairs on existing sanitary sewer pipelines.
- C. Use only pipe, fittings, and adapters approved by LRWRA.
- D. Use only standard bends, tees, plugs, wyes, or other approved fittings.
- E. All pipe and other materials shall be new.

1.02 RELATED WORK

- A. Section 02732 - Sanitary Sewer Service Lines
- B. Section 02605 - Manholes
- C. Section 02734 - Inspection and Testing of Sanitary Sewer Pipelines, Manholes, and Service Lines
- D. Section 02300 - Excavation, Backfilling, and Compacting
- E. Section 03300 - Cast-in-place Concrete
- F. Section 02734 - Inspection and Testing of Sewer Lines, Manholes, and Service Lines
- G. Section 06000 – Asphalt Pavement Repair
- H. Section 06001 – Concrete Pavement Repair
- I. Section 06002 – Gravel Pavement Repair

1.03 DEFINITIONS

- A. New Sewer Lines – Sewer lines installed in such a manner that there is no sewage flow during construction.
- B. Replacement Sewer Lines – Sewer lines installed in a trench while there is a flow from "live" service connections.
- C. Point Repairs - Replacement of a short section (less than 50 feet in length) in an existing sewer lines.
- D. Force Mains - Sewer pipelines that transport wastewater under pressure from a pump station to a discharge point.

1.04 QUALITY ASSURANCE

- A. Inspect all sewer lines per Section 02734 - Inspection and Testing of Sewer Lines, Manholes, and Service Lines.

1.05 SUBMITTALS

- A. Use of materials other than those specifically listed below is prohibited.
- B. Submit the manufacturer's certificate that the pipe meets with these Specification requirements including material testing requirements.

1.04 REFERENCES

- A. Not Used.

PART 2 - PRODUCTS

2.01 PROHIBITED PIPE MATERIALS

- A. The following materials are specifically forbidden for use either in LRWRA sewers or service lines:
 1. Asphalt impregnated fiber tube pipe.
 2. Clay pipe.
 3. Concrete pipe.
 4. Open profile PVC pipe as defined in ASTM F794 less than 24" in diameter.
 5. "No Hub" cast iron soil pipe or other non-bell and spigot pipe.
 6. Corrugated Metal Pipe.
 7. Glued joint pipe and fittings.

2.02 SERVICE LINES AND FITTINGS

- A. Refer to Section 02732 – Sanitary Sewer Service Lines.

2.03 BEDDING AND BACKFILL

- A. Refer to Section 02220 - Excavation, Backfilling, and Compacting.

2.04 MANHOLES, MANHOLE FRAMES, AND COVERS

- A. Refer to Section 02605 - Manholes.

2.05 CONCRETE

- A. Refer to Section 03300 - Cast-In-Place Concrete.

2.06 DUCTILE IRON PIPE FOR GRAVITY MAINS

- A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, AWWA C150, and ASTM A746, latest revisions.
- B. Ductile Iron Pipe shall be provided with **double thickness** cement mortar lining in accordance with AWWA C104.

- C. Minimum Pressure Class shall be as follows:
1. 18-inch and smaller 350 psi
 2. 20-inch and greater 250 psi
- D. All gravity ductile iron pipe located at a pump station site shall be furnished with a 40 mil nominal dry film thickness protective lining on the interior consisting of an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The lining material shall be Protecto 401 Ceramic Epoxy or approved equal. All cut ends shall be immediately repaired with a field epoxy touch-up kit. All other gravity ductile iron pipe and fittings shall have interior cement mortar lining in accordance with AWWA C104.
- E. Joint connections, pipe and fittings:
1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
 2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
 3. Grooved and shouldered: ANSI/AWWA C606.
- F. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals and cast or stamped on the outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.
- G. Corrosion Control
1. Polyethylene wrap in tube or sheet form conforming to the requirements of ANSI/AWWA C105/A21.5.
 2. All buried ductile iron pipe and fittings shall be furnished with standard bitumastic coating on the exterior per AWWA standard.
 3. Exposed ductile iron pipe shall be coated on the exterior with Tnemec 140-1211 primer, Series 66 HB Epoxoline at 4 to 6 mils, followed by Series 74 Endura Shield at 2 to 4 mils, or approved equal.
- H. Ductile iron pipe shall be made in the USA.

2.07 DUCTILE IRON FITTINGS

- A. All ductile iron fittings shall conform to the requirements of ANSI/AWWA C153/A21.53, latest revision, for Ductile Iron Compact Fittings. Minimum pressure class shall be the same as pipe.
- B. Ductile Iron Fittings shall be provided with **double thickness** cement mortar lining in accordance with AWWA C104.
- C. All ductile iron fittings located within a pump station site shall have a interior ceramic epoxy coating suitable for sewer service, Protecto 401, or equal. All other ductile iron fittings shall have interior cement mortar lining in accordance with AWWA C104.
- D. Buried ductile iron fittings shall be furnished with standard bitumastic coating on the exterior per AWWA standard.

- E. Exposed ductile iron pipe fittings shall be coated on the exterior with Tnemec 140-1211 primer, Series 66 HB Epoxoline at 4 to 6 mils, followed by Series 74 Endura Shield at 2 to 4 mils, or equal coating.
- F. Fittings shall be wrapped with polyethylene wrap in tube or sheet form conforming to the requirements of ANSI/AWWA C105/A21.5.

2.08 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE (Solid Wall)

- A. Pipe fifteen (15) inches in diameter and less shall conform to ASTM D 3034. Standard dimension ratio (SDR) shall be twenty-six (SDR 26).
- B. Pipe greater than (15) inches in diameter: conform to ASTM F 679 (PS 115).
- C. Joint connections: push on, elastomeric gasket type conforming to ASTM D 3212 and ASTM F477.
- D. Pipe shall be made of plastic having a cell classification of 12454-B as defined in ASTM D1784.
- E. Minimum pipe stiffness at 5% deflection shall be 115 psi.
- F. Marking: The date of manufacture, class of pipe, specification designation, size of pipe, name or trademark of manufacturer, and identification of plant/location shall be legibly marked on the outside of each pipe section in accordance with the ASTM D-3034.

2.09 CENTRIFUGALLY CAST FIBERGLASS GRAVITY SEWER PIPE

- A. Pipe shall conform to all requirements of ASTM 3262 for fiberglass pipe.
- B. Pipe stiffness shall meet or exceed manufacturer's recommendations. Minimum pipe stiffness shall be 46 psi.
- C. Manufactured by Hobas USA, Inc., or approved equal.

2.10 POLYETHYLENE ENCASEMENT (PIPE WRAP)

- A. Polyethylene encasement shall be in conformance to ANSI/AWWA C105, latest revision. The virgin linear low-density polyethylene film shall have a minimum normal thickness of .008 inches (8 mils), and shall be provided in either flat tube or sheet form.
- B. The color shall be black with nominal 2% carbon black UV inhibitor and printed per the AWWA C105 standard.
- C. Tape for field taping of polywrapped pipe, fittings, etc. or field repair of missing polyethylene encasement material shall be Polyken #900, Scotchrap #50 or equal, at least 2-inches wide, and installed as per the Polyethylene Encasement Installation Guide published by DIPRA. Duct Tape is not permitted.
- D. All buried iron pipe and fittings shall be poly wrapped.

2.11 SHIELDED COUPLINGS FOR GRAVITY MAINS

- A. Connection of new mains to existing mains shall be by a shielded coupling.
- B. Coupling shall be water-tight, leak proof seal that is resistant to both infiltration and exfiltration.
- C. Gasket shall meet the requirements of ASTM C1173.

- D. Couplings 4-inch through 8-inch and 10-inch shall incorporate a minimum of 2 clamps per band. Couplings 9-inch and 12-inch through 16-inch shall incorporate a minimum of 4 clamps per band.
- E. Coupling shall consist of corrosion resistant 304 stainless steel components, and a high impact polyimide (nylon) securing cage, over an injection molded EPDM rubber gasket.
- F. Shear band, screw housing, screw saddle, and screw shall be 304 stainless steel.
- G. Shielded flexible couplings shall be Maxadaptor by Gripper Gasket LLC, Fernco Strongback RC Series Coupling, or approved equal.

2.12 SERVICE LINE CONNECTION FITTINGS FOR GRAVITY MAINS

- A. Service connection fittings for gravity sewer pipe 15" and larger installed by conventional open cut, and lines rehabilitated by CIPP and pipe bursting method shall be model CB Sewer saddle manufactured by Romac Industries, Inc. of Bothell, WA (800-426-9341), or approved equal.
 1. Casting shall be ductile iron per ASTM 536 protected with yellow shop coat.
 2. Furnish with 3.5-inch wide stainless steel (per ASTM A240) adjustable strap.
 3. Bolts shall be ½ inch UNC rolled thread, lubricant coated, stainless steel per ASTM A193, type 304.
 4. Nuts shall be stainless steel per ASTM A 194, type 304.
 5. Washers shall be stainless steel per ASTM A240, type 304 and plastic lubricating washers.
 6. Gasket shall be SBR per ASTM D2000 compounded for water and sewer service.
 7. Opening for inserting the connection fitting into the wall of the pipe shall be made with a hole saw of the diameter and type recommended by the connection fitting manufacturer.
 8. The gasket used with the Romac fitting shall be for connection of the service line material specified above.
- B. Service connection fittings for gravity sewer pipe (6" through 12" in Diameter) installed by conventional open cut methods shall be molded wyes (material shall be similar to sewer main pipe), with elastomeric gasket bell and spigot ends meeting the same requirements as the sewer main pipe. Branch outlet shall include any necessary adapter to accept the service line material specified above and shown on the Drawings.
- C. All wyes where service connections are not immediately installed shall be sealed with a gasket type permanent plug.

2.13 SERVICE WYES FOR GRAVITY MAINS

- A. The wye material and joint type must match that of the mainline pipe.
- B. Wyes shall terminate in a bell suitable for connection of the 4-inch service line pipe as specified herein.

2.14 MECHANICAL JOINT RETAINER GLANDS

- A. Restraint devices for mechanical joint fittings and appurtenances for nominal pipe sizes 3-inch through 48-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
- B. Mechanical joint retainer glands shall be made from ductile iron and shall be designed for a working pressure of at least 350-psi for 3-inch through 16-inch ductile iron pipe, at least 250-psi for 18-inch through 48-inch ductile iron pipe. Mechanical joint retainer glands for Series 1100 by EBBA Iron, Inc. for 3-inch through 48-inch ductile iron pipe, Series 2000 PV for 3-inch through 36-inch PVC pipe, and Series 2200 for 42-inch through 48-inch PVC pipe.
- C. Retainer glands shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.
- D. Retainer glands shall be furnished on all mechanical joint fittings.

2.15 PIPE RESTRAINTS

- A. Bell restraints for AWWA C900 PVC sizes 4-inch through 12-inch shall be Series 1900 Restraint Harness, as manufactured by EBAA Iron, Inc., or approved equal. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.
- B. Bell restraints for AWWA C905 PVC sizes 14-inch through 36-inch shall be Series 2800 as manufactured by EBAA Iron, Inc., or approved equal. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.
- C. Bell restraints for SDR21 PVC sizes 2-inch through 12-inch shall be provided as required and shall be Series 6500 by EBBA Iron, Inc., or approved equal. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.
- D. Bell restraints for Ductile Iron Pipe sizes 4-inch through 48-inch shall be Series 1700 Restraint Harness, as manufactured by EBAA Iron, Inc., or approved equal. Devices shall have an approved coating system for corrosion resistance equivalent to MEGA-BOND® and manufacturing traceability.
- E. When all-thread attachments are required, eye-bolt style attachments are not acceptable. Romac “Ductile Lug” style attachments or approved equal shall be used. All-threads shall be made of 316 stainless steel.

2.16 BOLTS

- A. All bolts for valves, fittings, and restraints shall be 316 stainless steel. Anti-seize lubricant shall be used when assembling all stainless steel hardware to reduce galling.

2.17 POLYVINYL CHLORIDE (PVC) PIPE FOR FORCE MAINS

- A. PVC pipe less than 4 inches in size shall be manufactured in accordance with ASTM D-2241 and shall be minimum SDR 21. Pressure class of pipe shall be increased as appropriate for the design conditions and shall be as shown on the Drawings.
- B. PVC pipe 4 inches through 12 inches in size shall be manufactured in accordance with ASTM D-2241 minimum SDR 21 (200 psi) or AWWA C900, latest revision, and shall be minimum DR 25 (165 psi). Pressure class of pipe shall be increased as appropriate for the design conditions and shall be as shown on the Drawings.

- C. PVC pipe greater than 12 inches in size shall be manufactured in accordance with AWWA C905 and shall be minimum DR 25 (165 psi). Pressure class of pipe shall be increased as appropriate for the design conditions and shall be as shown on the Drawings.
- D. PVC pipe shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454 as defined in ASTM D1784, latest revision. Clean, reworked material generated from the manufacturer's own production shall be acceptable as long as the pipe produced meets all the requirements of the Specifications.
- E. Joints for PVC pipe shall conform to ASTM Specification D-3139, latest revision. Rubber gaskets shall comply with ASTM F-477, latest revision.
- F. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.
- G. Pipe shall be green in color.
- H. Marking on pipe and shall include the following and shall be applied at intervals of not more than 5 feet.
 - 1. Nominal size in inches and OD base (for example, 4 CI).
 - 2. PVC.
 - 3. Dimension ratio (for example, DR 14).
 - 4. AWWA pressure class (for example, PC 305).
 - 5. Test pressure for hydrotested pipe (for example, T330) or if not tested, "NOT HYDROSTATIC PROOF TESTED."
 - 6. AWWA designation number for this standard (ANSI/AWWA C900 or ASTM D-2241).
 - 7. Manufacturer's name or trademark and production run record or lot code.
 - 8. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable-water service.
- I. Fittings shall be ductile iron shall be in accordance with Part 2.05 above.

2.18 DUCTILE IRON PIPE FOR FORCE MAINS

- A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, latest revision.
- B. Ductile iron pipe shall be designed in accordance with the requirements of "Thickness Design of Ductile-Iron Pipe", ANSI/AWWA C150/A21.50, latest revision. Minimum pressure class shall be 250 psi.
- C. Joint connections, pipe and fittings (latest revision):
 - 1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
 - 2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
 - 3. Grooved and shouldered ANSI/AWWA C606.

- D. Nominal laying length shall be 20 feet. Minimum length of a cut section of pipe shall be 5 feet.
- E. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14 in. (356 mm) and larger shall be not less than 1/2 in. (13 mm) in height.
- F. Corrosion Control
 - 1. Ductile iron pipe and fittings shall be furnished with standard bitumastic coating on the exterior per AWWA standard. Exposed ductile iron pipe and fittings shall be coated on the exterior with Tnemec 140-1211 primer, Series 66 HB Epoxoline at 4 to 6 mils, followed by Series 74 Endura Shield at 2 to 4 mils, or approved equal.
 - 2. All gravity and force main ductile iron pipe and fittings located within a pump station site shall be furnished with a 40-mil nominal dry film thickness protective lining on the interior consisting of an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The lining material shall be Protecto 401 Ceramic Epoxy or approved equal. All cut ends shall be immediately repaired with a field epoxy touch-up kit. All other ductile iron fittings shall have interior cement mortar lining in accordance with AWWA C104.
 - 3. Cut sections of pipe shall be immediately repaired with a field kit to restore the ceramic epoxy coating system.
 - 4. Polyethylene wrap in tube or sheet form conforming to the requirements of ANSI/AWWA C105/A21.5, latest revision. The pipe shall be wrapped.

2.19 TAPPING SLEEVES FOR FORCE MAINS

- A. Tapping sleeve shall have a type 304 stainless steel body with carbon steel flanged outlet. Flange shall conform to AWWA C207, Class D, ANSI 150 lb. drilling.
- B. Tapping sleeve shall have a gasket giving 360 degree pipe coverage.
- C. Tapping sleeve shall be suitable for tapping the existing pipe material. Contractor shall verify existing pipe material before ordering tapping sleeve.
- D. Tapping sleeve shall be model JCM 462, Ford Fast, Smith Blair, or approved equal.
- E. Tapping valve shall be a resilient wedge gate valve with flanged inlet and MJ outlet in accordance with these specifications. Valve shall open left with standard 2-inch operating nut.

2.20 PLUG VALVES FOR FORCE MAINS

- A. Full port (100% area) plug valves shall be AWWA C517, latest revision shall be manufactured by Val-Matic, Dezurik PEC, or approved equal.
- B. Valves shall be installed along the length of the force main, not to exceed 1000' unless a variance is approved by LRWRA for long force mains. All lids shall have the word "SEWER" and a concrete collar with a minimum of 18 inches square or round dimension as appropriate.

2.21 GATE VALVES (4" AND LARGER)

- A. Gate valves shall be resilient seated gate valves complying with AWWA C515 and NSF 61. Valves shall have an AWWA 350 psi working pressure.
- B. Valves shall open counterclockwise (left).
- C. All buried gate valves shall have mechanical joint (MJ) ends unless otherwise noted on the Drawings and shall be furnished with full joint accessories. Buried gate valves shall ne non-rising stem with 2-inch standard operating nut.
- D. All exposed gate valves shall be resilient seated valves with handwheel operators. Flanges shall be 125 lb. standard. Flanged valves shall be furnished with flange bolts, nuts, and gaskets. Bolts for flanged connections shall comply with ANSI B16.1. Gaskets shall be red sheet rubber inserted gaskets of the ring gasket style.
- E. All interior and exterior ferrous surfaces of the valve body and bonnet shall be coated with a fusion-bonded epoxy coting, 8 mils D.F.T., complying with ANSI/AWWA C550.
- F. Gate valves shall be as manufactured by Mueller, or approved equal.

2.22 GATE VALVES (3" AND SMALLER)

- A. Gate valves 3" and smaller shall be 316 stainless steel gate valves, solid wedge disc, non-rising stem, with NPT threaded ends unless otherwise shown on Drawings. Furnish with wheel handle.
- B. Valves shall open counterclockwise (left).
- C. Valve shall have a 200 psi working pressure rating.
- D. Gate valves 3" and smaller shall be Series 302 as manufactured by Sharpe, or approved equal.

2.23 EXTENSION STEMS FOR VALVE OPERATORS

- A. Where the depth of the valve is such that its centerline is more than 4 feet below grade, provide operating extension stems to bring the operating nut to a point 12 inches below the surface of the ground and/or box cover.
- B. Constructed of steel.
- C. Complete with 2-inch square operating nut.
- D. Bolt to valve stem to prevent separation.

2.24 VALVE BOXES

- A. All buried gate valves shall be provided with cast iron valve boxes with cast iron lids.
- B. Valve boxes shall be the screw type suitable for the depth of bury as required.
- C. Valve boxes shall have 5-1/4 inch shaft.
- D. Valve boxes for valves shall have the word "SEWER" cast into the top of the lid.
- E. Round precast concrete collars shall be provided for all valve boxes as detailed on the Drawings.

- F. Support valve boxes with concrete blocks so that no weight exerted on the valve box will be transmitted to the valve.
- G. Boxes shall be as by Tyler, Mueller, or approved equal.
- H. Valve boxes for 2 inch and smaller valves shall be large flanged base type.

2.25 AIR / VACUUM RELIEF VALVES

- A. Sanitary sewer force mains shall be designed to avoid the need for air or vacuum release lines. If possible, force mains shall be designed without high points and with the top of the force main below the hydraulic grade line at the minimum pumping rate so that relief valves will not be needed.
- B. If high points in the force main cannot be eliminated, a stainless steel or composite A.R.I. (model #D-025 NPT) sewage air release valve or approved equal shall be installed at each significant high point where air could become trapped. The air release valve shall be installed in a manhole structure in accordance with the requirements of Section 3300-Manholes, and provisions shall be required for draining the structure.

2.26 TRACER WIRE

- A. Tracer wire shall be 14-gauge solid coated copper for underground burial.
- B. Jacket color shall be GREEN and made of High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE) designed for direct burial.
- C. Connectors shall be used for all splices or repairs. Connectors shall be moisture displacement style as manufactured by 3M DBR, or equal.
- D. A locate or conductivity test shall be performed prior to signing off on the project.
- E. A tracer wire test station shall be installed every 1,000 feet, in the vicinity of the discharge manhole, and at fittings that cause a change in direction where the tracer wire can be brought to grade for a point of connection to aid in tracing the force main. All lids shall have the word "SEWER" and a concrete collar with a minimum of 18 inches square or round dimension as appropriate. Tracer wire test station shall be in accordance with LRWRA Standard Details.

2.27 MARKING TAPE

- A. Non-metallic sanitary sewer marking tape shall be warning tape as manufactured by Rhino Marking and Protection Systems, Terra Tape Extra Stretch, Harris Industries, Inc., or approved equal.
- B. Tape shall have a minimum thickness of 4 mils and manufactured with heavy metal-free polyethylene tape that is impervious to all known alkalis, acids, chemical reagents, and solvents found in soil. The minimum overall width of the tape shall not be less than 3-inches. Standard rolls shall be 1000' length.
- C. The tape shall be color coded Safety Green and imprinted with the following message: Caution – Buried Sewer Line Below

2.28 SEWER LINE MARKERS

- A. Sewer line markers shall be fiberglass reinforced composite, 3.75-inches wide and green in color.

- B. Sewer line markers shall be as manufactured by Rhino Marking and Protection Systems, Carsonite International, or approved equal. All markers shall be installed according to the manufacturer's recommendations.
- C. Fiberglass sewer line markers shall have decals for visible identification of buried sewage force main day or night on both sides of the marker.
- D. Sewer line pipeline markers shall be installed every 500 feet and beside all manholes that are located in easements and backyards. Manholes located in front yards and in streets do not require markers.
- E. Sewer line pipeline markers shall be installed along sewer force mains at valves and at fittings that cause a change in direction.

PART 3 - EXECUTION

3.01 EXCAVATION - GENERAL

- A. Perform excavation and prepare bedding in accordance with Section 02220 - Excavation, Backfilling, and Compacting.
- B. Never lay pipe in a water-filled trench, or when trench conditions or weather are unsuitable for such Work.
- C. Divert surface water and de-water trenches during excavation.
- D. Excavate for bells so that the entire barrel of the pipe will be uniformly supported on the pipe bedding before placing pipe in the trench.

3.02 LAYOUT

- A. The Contractor shall install sewer lines, wyes, and manholes as shown on the Plans.

3.03 SHALLOW BURY

- A. Ductile iron pipe shall be required when the existing grade or the proposed finish grade, whichever is less, provides less than 30 inches of cover. The ductile iron pipe shall extend from manhole to manhole.

3.04 PIERS

- A. Install concrete piers as indicated on the plans per Section 03300 - Cast-In-Place Concrete.

3.05 STEEP GRADES

- A. Whenever the grade of the sewer line exceeds 15 percent, ductile iron pipe shall be required.
- B. Sewers on 20 percent slopes or greater shall be anchored securely with concrete anchors spaced as follows:
 1. Not over 36 feet center to center on grades 20 percent and up to 35 percent.
 2. Not over 24 feet center to center on grades 35 percent and up to 50 percent.
 3. Not over 16 feet center to center on grades 50 percent and over.

- C. Anchor collars should be placed on downstream side of bell. Where no bell is available, a retainer gland shall be installed.

3.06 CONCRETE DAM

- A. Concrete dams shall be constructed at each connection location of new sewer pipe to the existing sewer system. Dams are to be constructed to control the migration of groundwater from the new sewer trench to the existing sewer system. Dams shall be constructed in the sewer trench, outside the limits of excavation for manholes.
- B. Hand excavate around the sewer pipe into undisturbed earth a minimum of six inches into bottom of the trench and the trench wall perpendicular to the pipe. The hand excavated void around the pipe shall be filled with concrete and a form shall be used to hold the concrete in place. The form may be left in place after backfilling and restoration. The dam shall be a minimum 8-inches thick and extend two (2) feet above the top of the bedding for the pipe.

3.07 PIPE INSTALLATION

- A. Inspect each joint of pipe carefully internally and externally before it is placed in the trench. Plainly mark and separate from the remaining pipe any joint found to be cracked, warped, or otherwise damaged. Remove these damaged joints from the project site as soon as possible.
- B. Cut pipe in a neat and workmanlike manner without damage to pipe or pipe lining when trimming joint length. Cut ends shall be beveled according to the manufacturer's recommendations to prevent damage to the bell gasket. Cut ends for Protecto 401 lined pipe shall be immediately repaired using a field repair kit.
- C. Lay all pipe with the bell upstream.
- D. Use proper equipment for lowering sections of pipe into trenches. Lower pipe carefully into the trench so the spigot and bell will not become contaminated.
- E. Lay each pipe joint to line and grade using laser beam grade light, keeping a minimum of six inches between the pipe and the trench wall.
- F. Keep the pipe joints' interior clean from all dirt and other foreign matter as the Work progresses. Maintain the pipe's interior cleanliness until accepted or put in service.
- G. Close the open ends of the pipeline temporarily with an appropriate manufactured watertight plug at the end of each day's Work or when discontinuing pipe installation for an appreciable period.
- H. COLD WEATHER INSTALLATION
 - 1. LRWRA reserves the right to order pipe installation discontinued whenever, in its opinion, there is danger of the quality of work being impaired because of cold weather. The Contractor shall be responsible for heating the pipe and jointing material so as to prevent freezing of joints. Do not lay any pipe on frozen ground. No flexible or semi-rigid pipe shall be laid when the air temperature is less than 32o F unless proper precautions per the manufacturer's recommendations are taken by the Contractor and the method is approved by the Engineer and LRWRA.
 - 2. When pipes with rubber gaskets or resilient-type joints are to be laid in cold weather, sufficiently warm the gasket or joint material so as to facilitate making a proper joint.

I. TRACER WIRE

1. Tracer wire shall be installed on all buried sewer force mains.
2. Tracer wire shall be installed directly under the sewer line for depths not to exceed six (6) feet. For depths exceeding six (6) feet, the tracer wire shall be buried directly over the centerline of the pipe at a depth no greater than six (6) feet and a minimum of four (4) feet.
3. A tracer wire test station shall be installed every 1,000 feet, in the vicinity of the discharge manhole, and at fittings that cause a change in direction where the tracer wire can be brought to grade for a point of connection to aid in tracing the force main. Tracer wire test station shall be in accordance with LRWRA Standard Details.
4. Connectors shall be used for all splices or repairs.
5. A locate or conductivity test shall be performed prior to signing off on the project.

J. MARKING TAPE

1. Marking tape shall be installed on all buried sewer pipelines. This includes gravity sewer mains, sewer force mains, and gravity sewer laterals.

3.08 PIPE TO PIPE CONNECTIONS

- A. Make all pipe joints in strict accordance with the manufacturer's recommendation and as stated below for the particular type of connection. Make all joints watertight in accordance with the latest ASTM Standards.
- B. Slip-type or Push-on Joints Connection Procedure
 1. Clean the bell and spigot end of the pipes prior to jointing thoroughly with a brush. Exercise particular care to clean the gasket seat.
 2. Apply pipe lubricant and attach gasket in strict accordance with the specific joint manufacturer's recommendations. Clean and insert the rubber gasket in the gasket seat within the bell. Insert the spigot end of the upstream pipe in the bell of the downstream pipe. Push the upstream joint until it is in firm contact with the shoulder of the bell.
- C. Mechanical Joints Connection Procedure
 1. Clean thoroughly the spigot end of the pipe, the bell of the connecting pipe, and the rubber gasket as specified for slip-type or push-on joints. Clean the gland in a similar manner.
 2. After the gland and gasket are placed on the spigot end of the pipe, a sufficient distance from the end to avoid fouling the bell, insert the spigot end in the fitting bell to the point of firm contact with the bell shoulder. Then advance the rubber gasket into the bell and seat in the gasket seat. Exercise care to center the spigot end within the bell. Bring the gland into contact with the gasket, enter all bolts, and make all nuts hand tight. Exercise continued care to keep the spigot centered in the bell.
 3. Make the joints tight by turning the nuts with a torque wrench: First partially tightening a nut, then partially tightening the nut 180 degrees away from it. Work around the pipe with uniformly applied tension until the required torque is applied to all nuts. Required torque ranges and indicated wrench lengths for bolts are as follows:

Diameter (inches)	Range of Torque Foot Pounds	Length of Wrench (inches)
5/8	40-60	8
3/4	60-90	10
1	70-100	12
1-1/4	90-120	14

D. Shielded Couplings

1. Install shielded coupling where dissimilar pipe materials are connected.
2. Take care that proper alignment is maintained and a maximum spacing between pipes does not exceed one-half inch.

3.09 WYE FITTINGS FOR SERVICE CONNECTIONS

- A. Use in-line wye fittings for all service connections except on ductile iron pipe and polyethylene pipe.
- B. The wye material and joint type must match that of the mainline pipe.
- C. Use taps instead of wyes only on ductile iron pipe and polyethylene pipe.
- D. Install wye branches at the location of live services or as indicated on the construction plans. Install wye connections for services in accordance with the manufacturer's recommendations.
- E. Place Class "A" concrete under each wye branch to prevent cracking or twisting under earth loads.
- F. Mark wyes for future connections using marking tape, tracer wire, yellow nylon rope, and 1/2" x 4' rebar or fence tee-post.
- G. Terminate wyes for future connections in a bell suitable for connection of a four-inch SCH-40 PVC service line. Securely plug all wyes and service stubs for future connections.
- H. For Service Wye Details, see the Standard Detail Drawings.

3.10 BACKFILLING AND INSPECTION

- A. Before backfilling, place concrete encasement at transitions between different types of pipe and around all couplings as shown on the Drawings. Use Class A concrete per Section 3600-Cast-In-Place Concrete.
- B. Before backfilling, install concrete anchor collars in accordance with the details at the location and interval and shown on the Drawings. Use Class B concrete and reinforce with steel bars per Section 03300-Cast-In-Place Concrete.
- C. After the pipeline is installed and visually inspected by LRWRA or their designated representative, backfill the trench per Section 02300-Excavation, Backfilling, and Compacting.
- D. Test the pipeline per Section 02734-Inspection and Testing of Sewer Lines, Manholes, and Service Lines.

- E. Repair all pavements per Section 06000-Asphalt Pavement Repair, Section 06001 Concrete Pavement Repair, and Section 06002 Gravel Surfacing Repair.
- F. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.
- G. Repair sodded and grass areas to original condition.

3.11 CONNECTION OF NEW SEWER LINES TO EXISTING SEWER LINES

- A. Connection of new sewer lines to existing sanitary sewers cannot be made until the entire project has been accepted by LRWRA.
- B. Construct, clean, test, and obtain LRWRA approval for sewer lines and manholes before connecting new sewer lines to the existing sewer.
- C. All new sewer lines must connect to the existing system at a new or existing manhole. If a new manhole is built over an existing sewer line, do not break out the top of the existing pipe until the new line is accepted.
- D. If a new sewer line is to discharge into an existing manhole, divert the sewage flow around the existing manhole while the tie-in is under construction. Intercept the sewage flow at the existing manhole first upstream from the tie-in construction. Provide suitable pumping equipment and re-routing conduit to pump the sewage around the tie-in construction. Discharge into an appropriate manhole downstream from the construction.
- E. Connection to an existing manhole shall be made by core drilling. A concrete manhole adapter shall be installed on the sewer pipe, and the annular space grouted in accordance with Section 02605 – Manholes.
- F. Connect new sewer lines to existing manholes in a neat, workmanlike manner, to ensure a watertight connection.

3.12 GRAVITY SEWER LINE INSTALLATION – LIVE SEWER LINES AND POINT REPAIRS

- A. Install sewer lines and point repairs as detailed above for new sewer lines with the following exceptions:
 1. Divert all upstream flow around the section to be replaced with plugs or pumps. The bedding must be kept dry during installation. If trench bottom is too wet, excavate wet portion and replace with bedding material.
 2. Make transitions to original pipe using materials and procedures specified. Take care that replacement pipe is aligned properly with no offsets. Install concrete encasement around transitions. Take care that no concrete from the encasement enters the existing pipeline. If this occurs, remove the concrete.
 3. At the end of each day's work, and when for any reason the laying of pipe will be discontinued for an appreciable period, place a temporary section of pipe in the live line.
 4. Pressure testing is not required. Visual and television testing are required.
 5. Mandrel testing is required if requested by LRWRA.
 6. Service line pressure testing is not required.

7. A temporary debris catcher, as shown in the Standard Detail Drawings, shall be used in the downstream manhole.

3.13 GRAVITY SEWER LINE INSTALLATION - AERIAL CROSSINGS

- A. Construct piers in accordance with LRWRA Standard Details.
- B. Install pipe on piers to grade.

3.14 FORCE MAIN PIPE INSTALLATION

- A. Install all pipe and fittings to the line and grade as detailed on the Drawings.
- B. The force main shall have tape marked sewer installed in the trench 18" above the top of the sewer force main.
- C. Remove all dirt and other foreign matter from the inside of pipe and fittings before they are lowered into the trench. Keep pipe and fittings clean during and after laying. Take care to keep dirt out of the bells. Plug all pipe openings at the end of each days work or when pipe laying is discontinued.
- D. Use proper equipment for lowering sections of pipe into trenches. Lower pipe carefully into the trench so the spigot and bell will not become contaminated.
- E. Cut pipe in a neat and workmanlike manner without damage to pipe or pipe lining when trimming joint length.
- F. Install pipe with bell ends facing in the direction of laying. Face bells upgrade on lines on an appreciable slope.
- G. When necessary to deflect pipe from a straight line in either the horizontal or vertical plan to avoid obstructions, do not deflect the pipe beyond the point recommended by the pipe manufacturer.
- H. Before backfilling, install concrete thrust blocking in accordance with Standard Details on Plans. Thrust blocking shall be designed based on pressures of at least 25 percent greater than the maximum pump design shutoff head plus a water hammer allowance with an appropriate factor of safety.
- I. Sewer line pipeline markers shall be installed beside all manholes and valve boxes that are located in easements and backyards. Manholes and valve boxes located in front yards and in streets do not require markers.
- J. Install valves and other appurtenances in accordance with LRWRA Standard Details and in accordance with manufacturer's recommendations.
- K. Test the pipeline per Section 02734-Inspection and Testing of Sewer Lines, Manholes, and Service Lines.
- L. After the pipeline is installed and visually inspected by the Engineer, backfill the trench per Section 02220-Excavation, Backfilling, and Compacting. Repair all pavements per Section 06000-Asphalt Pavement Repair, Section 06001 Concrete Pavement Repair, and Section 06002 Gravel Surfacing Repair. Repair all incidental damage to buildings, structures, utilities, pavements, landscaping, etc.
- M. Repair sodded and grass areas to original condition.

3.15 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

- A. Polyethylene material, either in tubing form or in the form of flat sheet or rolls, as specified herein, shall be placed around all buried mechanical joints of pipe and fittings, valves, sleeves, couplings, and any other appurtenance with exposed bolts. Any and all iron or steel components installed below ground shall be double wrapped with the polyethylene material.
- B. Ductile iron and steel pipe and appurtenances shall be completely encased in polyethylene tubing material. It is not the intent that the material form an enclosure that is absolutely air or water tight, but to prevent pipe to soil contact.
- C. Polyethylene tubing shall be applied to pipe by one of the following methods:
 1. Method "A": Cut polyethylene tubes to a length approximately two feet (2') longer than the length of the pipe section. Slip the tubes around the pipe, centering it to provide a one foot (1') overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure in place. Then slip the end of the polyethylene from the new pipe section of the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.
 2. Method "B": Cut polyethylene tubes to a length approximately one foot (1') shorter than the length of the pipe section. Slip the tubes around the pipe, centering it to provide six inches (6") of bare pipe at each end. Make polyethylene snug, but not tight; secure ends. Before making up a joint, slip section of three foot (3') length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the section of three foot (3') length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot (1'); make snug and secure each end.
- D. Pipe-Shaped Appurtenances. Bends, reducers, offsets, and other pipe-shaped appurtenances shall be covered with double layers of polyethylene in the same manner as the pipe.
- E. Odd-Shaped Appurtenances. Valves, tees, crosses and other odd-shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with two layers of flat sheets or split length of polyethylene tubes. The sheets shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Slack width and overlaps at joints shall be handled as described in Paragraph 3.13.C.1 above. Tape polyethylene securely in place at valve stem and other penetrations.
- F. Openings in Tubing Material. Openings for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making an "X" shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.
- G. Junctions Between Wrapped and Unwrapped Pipe. Where polyethylene wrapped pipe joins a pipe that is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least two feet (2') and secure the end.
- H. The polyethylene material shall be secured around the pipe and appurtenances by at least three (3) circumferential wraps of tape (see Section 3000 for materials).

- I. All tongs, cables, or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.
- J. Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open, wrapped around the pipe and secured in place.
- K. Polyethylene material shall be stored on the job site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed forty-eight (48) hours.
- L. Backfill material shall be the same as specified for pipe without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, and/or other material that could damage polyethylene.

3.16 WATER LINE CROSSINGS

- A. Sewer lines installed under a water line must have a clear distance between pipes of at least eighteen (18) inches.
- B. The sewer line shall be installed such that a joint of pipe is centered along the water line and the joints are as far as possible from the water line.
- C. If 18-inches of clearance cannot be provided or when the water main must pass under the sewer main, either the sanitary sewer main or the water main shall be encased in twenty (20) feet of watertight encasement pipe, centered over the point of crossing. Crossings that are not perpendicular will require more than twenty (20) feet of encasement. The encasement shall extend a minimum of ten (10) feet perpendicular from the outside edges of the line that is not being encased. The ends of the encasement pipe shall be sealed watertight. Refer to Section 3400 – Steel Encasement Pipe.

3.17 STORM SEWER CROSSINGS

- A. All sewer lines installed under a storm sewer must have a clear distance between pipes of at least eighteen (18) inches.
- B. If 18-inches of clearance cannot be provided, install ductile iron pipe from manhole to manhole.

END OF SECTION 02610