

SECTION 332040

LAYING AND JOINTING BURIED PIPES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.

1. Use proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings.
2. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.
3. Lay all underground pipelines not supported on piles or concrete cradle in select fill bedding material.
4. Close off all lines with bulkheads when pipe laying is not in progress.

B. Related Work Specified in Other Sections Includes:

1. Section 311020 – Dewatering
2. Section 311020 - Trenching, Backfilling and Compaction
3. Section 311030 - Granular Fill Materials
4. Section 331010 - PVC Pressure Water Pipe
5. Section 331020 - Force Main
6. Section 331030 - Gravity Sanitary Sewer System
7. Section 331040 - Valves and Appurtenances
8. Section 331050 - High Density Polyethylene (HDPE) Pipe

1.2 REFERENCES

- A. Codes and standards referred to in the Section are:
1. ASTM D 2774 - Practice for Underground Installation of Thermoplastic Pressure Piping
 2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
 3. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile
 4. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800
 5. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges
 6. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 7. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Threaded Flanges
 8. Uni-Bell - Handbook of PVC Pipe

1.3 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 01 and as follows:
- B. Transportation and Delivery: Take every precaution to prevent damage to the pipe during transportation and delivery to the site.
- C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.
1. Work slowly with skids or suitable power equipment and keep pipe under perfect control.
 2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.
- D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.
1. Under no condition pass the sling through the pipe. Interior of pipe is to be kept free of dirt and foreign matter.
 2. Use a nylon canvas type sling or other material designed to prevent

damage to the pipe and coating.

3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.

E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace such pipe or pipes.

F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.

1. Obtain approval for the type of blocking and stakes, and the method of installation.

G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed. Store gaskets in a sealed container (such as a vented drum). When long-term storage with exposure to direct sunlight is unavoidable, PVC pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation (refer to the Uni-Bell PVC Handbook).

1. Do not use any gaskets showing signs of cracking, weathering or other deterioration.
2. Do not use gasket material stored more than six (6) months without NPU approval.

1.4 FIELD CONDITIONS

A. Repair of Sanitary Sewers and Services: Re-bed, in compacted select fill material, sanitary sewers which cross over the new pipe or which cross under the new pipe with less than 12-inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.

1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.
2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.
3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 - PRODUCTS

- A. The materials allowed for buried sewer pipes are PVC, HDPE or Ductile Iron Pipe.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.
 1. Where groundwater is encountered, make every effort to obtain a dry trench bottom in accordance with Section 311010.
 2. Perform trench excavation and backfill in accordance with Sections 311020.

3.2 INSTALLATION

- A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 01. Where pipe joint deflections are used, do not exceed 75 percent of the maximum deflection limits shown in AWWA C600 and/or manufacturer's limits, whichever allows less deflection. Gravity systems shall contain no joint deflection.
 1. Arrange miscellaneous pipelines, which are shown on the plans, clear of other pipelines and equipment.
 2. Gravity systems shall not contain vertical dips greater than three-fourths an inch (3/4").
- B. Code Requirements: Provide pipeline installations complying with AWWA C600 for iron pipe, AWWA Manual M11 for steel pipe, ASTM D 2774 for thermoplastic pressure piping, and as modified or supplemented by the Specifications.
- C. Pipe Laying - General:
 1. Thoroughly inspect all pipe for damage and cleanliness. If found to be defective, tag, remove and replace pipe with satisfactory pipe or fittings at no additional charge to the City.
 2. Generally, lay all pipe with bells pointing ahead.

3. Carefully place all pipe, pipe fittings, valves and hydrants into trench by means of a derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage and check for alignment and grade.
4. Adjust pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.
5. Wedging or blocking up the pipe barrel is not permitted.
6. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.
7. As the work progresses, clean the interior of pipelines of all dirt and superfluous materials.
8. Keep all lines clean during construction.
9. Lay pipelines accurately to line and grade.
10. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other material from entering the pipe.

D. Pipe Laying - Trenches:

1. Carefully lay all pipelines in trench excavations piece by piece using suitable tools or equipment on select fill bedding, concrete cradle or other foundations as shown in the plans, specified or ordered in writing. Prevent damage to materials, protective coatings and linings.
2. Do not dump or drop pipe or pipe materials into trench.
3. Properly secure the pipe against movement and make the pipe joints in the excavation as required.
4. Carefully grade and compact pipe bedding.
5. Bell Holes:
 - a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.
 - b. Thoroughly tamp bell holes full of select fill material following the making of each joint to provide adequate support to the pipe throughout its entire length.

- E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.
- F. Field Cuts of Pipelines: For shorter than standard pipe lengths, make field cuts in a manner producing a cut square and perpendicular to the pipe axis. Remove any sharp, rough edges which otherwise might injure the gasket.
- G. Procedure for sealing cut ends and repairing field damaged areas of polyethylene lined pipe and fittings is as follows:
1. Remove burrs caused by field cutting of ends or handling damage and smooth out edge of polyethylene lining if made rough by field cutting or handling damage.
 2. Remove oil or lubricant used during field cutting operations.
 3. Areas of loose lining associated with field cutting operation must be removed and exposed metal cleaned by sanding or scraping. For larger areas, remove loose lining and dirt, then roughen bare pipe surface by scratching or gouging with a small chisel to provide an anchor pattern for the epoxy. It is recommended that the polyethylene lining be stripped back by chiseling, cutting, or scraping about one (1) inch to two (2) inches into well adhered lined area before patching. This ensures that all areas of undercutting have been removed. Be sure to roughen an overlap of one (1) inch to two (2) inches of polyethylene lining in area to be epoxy coated. This roughening should be done with a rough grade emery paper (40 grit), rasp, or small chisel. Avoid honing, buffing, or wire brushing since these tend to make surface to be repaired too smooth for good adhesion.
 4. With area to be sealed or repaired clean and suitably roughened, apply a thick coat of a two-part coal tar epoxy. The heavy coat of epoxy must be worked into the scratched surface by brushing. Mixing and application procedure for the epoxy must follow the epoxy manufacturer's instructions.
 5. It is important that the entire freshly cut, exposed metal surface of the cut pipe be coated. To ensure proper sealing, overlap at least one (1) inch of the roughened polyethylene lining with this two-part epoxy system.
- H. Ductile Iron Pipe Mechanical Joints:
1. Assembly: In making up mechanical joints, center the spigot in the bell.

- a. With a wire brush just prior to assembly of the joint thoroughly brush eight (8) inches outside of spigot and inside of bell with which the rubber gasket comes in contact. Remove all oil, grit, tar (other than standard coating) and other foreign matter from joint.
- b. Brush lubricant over the gasket just prior to installation. (Note: There is only one rubber gasket size for each diameter of pipe.)
- c. Press the gasket into place within the bell and move the gland into position, bolts inserted, and the nuts tightened finger tight.
- d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly. Torque wrenches shall be set as specified in AWWA C111. Spanner type wrenches not longer than specified in AWWA C111 may be used with the permission of Engineer, NPU or designee.
- e. Tighten all nuts 180-degrees apart alternately in order to produce equal pressure on all parts of the gland.

2. Torques: Apply the following range of bolt torques:

Size (inches)	Range of Torque (ft-lbs)
5/8	40-60
3/4	60-90
1	70-100
1-1/4	90-120

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

I. Ductile Iron Pipe Rubber Gasket Joints:

- 1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.
 - a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.
 - b. Apply a thin film of lubricant (AWWA C600) to the inside surface of the gasket that will come in contact with the entering pipe.
 - c. Brush the plain end of the pipe to be entered thoroughly with a wire

brush and place it in alignment with the bell of the pipe to which it is to be joined.

d. Exert enough force on the entering pipe so that its plain end is moved past the gasket until it contacts the base of the socket to make the joint.

2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.

a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.

b. If the gasket has been damaged, replace it with a new one before reinstalling the pipe.

3. Optional Mechanical Joints: Use mechanical joint fittings that meet the requirements of Section 331010 with the rubber gasket joint pipe when specified or when rubber gasket fittings are not available.

J. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.

1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.

K. Temporary Blow-Off Assembly: Dead-end water lines shall be temporarily ended with a blow-off as shown in City of North Port Standard Details. After full bore flush replace with a fire hydrant meeting the requirements of Section 333040.

L. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.

1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.

M. Concrete Encasement: Concrete encasement shall be constructed in accordance with North Port Utilities Standard Details when:

1. A potable water main crosses at a depth that provides less than 18-inches clear distance from sewer lines with approval from the Engineer

and NPU. Encase the sewer main unless specifically approved by NPU. Encasement shall extend a minimum ten (10) feet on each side of the point of crossing. Pressure test both pipelines to 150 psi after the concrete has properly cured.

2. A water main running parallel to a sewer line provides less than ten (10) feet separation from sewer lines, in which case approval from the Engineer and NPU is required. Encase the sewer main unless specifically approved by NPU.
3. The Engineer or NPU has ordered the line encased. NO POTABLE WATER MAIN SHALL BE ENCASED IN CONCRETE UNLESS SPECIFICALLY AUTHORIZED BY THE ENGINEER, NPU, OR DESIGNEE.

The points of beginning and ending of pipe encasement shall be not more than six (6) inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

N. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.

1. Adjust valve-box to final grade at the time designated by NPU or designee.
2. Build a collar, as shown in the standard details, 24 inches by 24 inches by six (6) inches or 24-inch diameter round by six (6) inches flush to grade of top of box. Similar collar shall be poured flush with grade and top of unpaved areas.
3. Satisfactorily reset any valve box that is moved from its original position, preventing the operation of the valve.
4. Replace any valve box that has been damaged.

O. Identification:

1. Metallized Marking/Warning Tape: For DIP and PVC pipe (other than gravity sewer pipe and laterals) to be installed, three (3) inch detectable marking tape, of appropriate color and appropriate warning statement, shall be placed along the entire pipe length. The marking tape shall be installed two (2) feet below grade or one-half (1/2) the pipe's bury, whichever is less, during backfill operations. All PVC pipe, PVC fittings, and identification tape shall be color-coded. HDPE pipe installed by horizontal directional drilling will not be required to be marked with metallized warning tape.

2. Electronic Markers: Install 3M electronic marker balls twenty-four (24) inches below final grade, above pipe, at all bends or changes in alignment and every two hundred and fifty feet (250') along the pipe between bends.

P. Separation from Other Pipe Systems:

1. Parallel Water and Sewer or Non-Potable Lines: Sanitary sewer lines, storm sewers or force mains shall be separated from water mains by a minimum clear vertical distance of 18 inches and a horizontal distance of ten (10) feet. Non-potable, reclaimed or reuse water mains shall be separated from water mains, gravity sewers or force mains by a minimum clear vertical distance of 18 inches and a horizontal distance of five (5) feet center to center or three (3) feet outside to outside. When this standard cannot be maintained, the sewer line shall be concrete encased for a distance of ten (10) feet each way from the water line and any other conduit, with a minimum vertical clearance of twelve (12) inches being provided.
2. Crossing Water and Sewer or Non-Potable Lines: Water mains crossing over a sewer or non-potable water line shall be (bottom of water main to top of sewer) separated by at least 18 inches unless local conditions or barriers prohibit. It is the Contractor's responsibility to verify location and depth of all underground existing utilities and to contact Sunshine 811 prior to construction.

Q. Aerial Crossings:

1. Pipes spanning elevated pier crossings shall be flanged ductile iron Pressure Class 350 pipe conforming to AWWA C115, C150 & C151. Pipe spanning on piers spaced further apart than normal pipe length of 18 or 20 ft. shall be multiple length pipe with interior flanged joints with a rubber gasket pipe. The pipe wall thickness and flanged joints shall be designed to safely span the elevated piers under working pressure without exceeding the allowable stresses and conform to AWWA C150. Limit pipe deflection at center of span with pipe full of water to 1/720 of span length. Provide expansion joints between above ground and below ground wastewater lines.
2. Flanges shall conform to AWWA C150 and C115. All bolts and nuts used in aerial crossings shall be 304 stainless steel. Gaskets shall be full faced or recessed "O-Ring" type to prevent leaks in pipe under stress in the aerial crossing.
3. Outside surface of all pipe, flanges or spool pieces shall be shop coated with zinc primer, High Build Epoxy protective coat and a finish coat of

polyurethane high gloss. Color shall be Federal Safety Blue for potable water mains and Pantone Purple 522 C for non-potable irrigation water mains.

4. Install operating valves or other flow regulating devices adjacent to the water's edge or at a safe distance from the water's edge to prevent discharge in the event the line is damaged.
5. Install supports for all joints in pipes utilized for aerial crossings and to prevent overturning and settlement. Expansion jointing is specified between above ground and below ground sewers and force mains.

3.3 FIELD QUALITY CONTROL

A. Testing: Test pipelines in accordance with Section 331010, Section 331020, and Section 331050.

1. Test valves in place, as far as practicable, and correct any defects in valves or connections.
2. Gravity Sewer Lines: Test in accordance with Section 331030.

B. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special for defects before it is installed.

1. Cut away any lumps or projections on the face of the spigot end or the shoulder.
2. Do not use any cracked, broken, or defective pieces in the work.
3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in contract amount.

3.4 CLEANING

A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed work.

B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the work, remove and clean the pipe.

3.5 DISINFECTION

A. General: Disinfect all pipelines that are to carry potable water in

accordance with Section 331010.
END OF SECTION