



WATER DEPARTMENT
STANDARD SPECIFICATIONS

SECTION 300
STANDARD SPECIFICATIONS FOR WATER MAINS

JANUARY 1, 2018

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300.01 SCOPE

These general and detailed Specifications shall govern the handling and installation of water piping, valves, hydrants, and accessories described herein, and as shown on the attached drawing.

300.02 MATERIALS

Unless otherwise specified or absolutely unavailable, all materials shall be domestic; manufactured and assembled in the United States. Alternatives must be pre-approved before awarding of bids.

All water main installed under asphalt or concrete pavement surfaces shall be ductile iron.

- A. Ductile Iron Pipe - Ductile iron pipe for water lines shall meet requirements of AWWA Specification C151 and shall be push-on joint or mechanical joint, unless otherwise shown on the Plans. Working pressure shall be 150 psi.
1. Ductile iron pipe shall be centrifugally cast with minimum thickness class of 51 for 3 inch through 4 inch pipe, and minimum thickness of class 50 for 6 inch through 20 inch pipe.
 2. When ductile iron pipe is used, a Registered Engineer shall submit certification that the soil along the route of the proposed pipeline has been analyzed and evaluated in accordance with Appendix A of AWWA Specification C105, and that the soil will not be corrosive to ductile iron pipe. If this required certification is not furnished, or if the soil is shown to be corrosive to ductile iron pipe, then the pipe shall be wrapped with polyethylene encasement in accordance with the requirements of AWWA Specification C105. The thickness of ductile pipe may be increased by one class thickness in lieu of providing soil survey.
 3. It shall be clearly stated on Plans for all water line projects if the ductile iron pipe is to be wrapped with polyethylene encasement.
 4. The interior of all pipe shall be cement-mortar lined as specified in AWWA Specification C104 and the interior and exterior shall receive an approved bituminous coating. All gaskets shall be furnished.
 5. If it is necessary to cut ductile iron pipe, in no case shall it be cut by burning, but shall be cut by saw, cutter, abrasive wheel or other approved means.

6. The pressure rating, metal thickness, net weight of pipe without lining, length of pipe, name of manufacturer, and letters "DI" shall be clearly marked on each length of pipe.
- B. Flexible Joint Pipe - Flexible joint pipe shall meet the requirements of AWWA C151 for ductile iron pipe and may be of the bolted or boltless type suitable for 150 psi working pressure. If bolted type pipe is used, all bolts shall be Corten Steel. The interior and exterior of all pipe and fittings shall receive an approved bituminous coating, except the ball and machined surfaces which shall receive a protective coating as recommended by the manufacturer. All ball joint pipe shall be assembled, lubricated and installed in strict conformance with the pipe manufacturer's recommendations.
- C. Polyvinyl Chloride (PVC) Pressure Pipe - Polyvinyl chloride (PVC) pressure pipe may be used for sizes 6 inch through 12 inch water lines, except for creek crossings and 50 feet adjacent thereto, and dead ends of lines.

PVC pipe shall conform to the requirements of AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe. Pipe shall be Class 150 with a Standard Dimension Ratio (SDR) of 18 or heavier. Pipe joints shall be integral bell and spigot type with rubber ring sealing gasket. The pipe bell shall be designed to be at least as strong as the pipe wall. Standard lengths shall be 20 feet, except that 15 percent of total footage for a particular project may be random lengths of not less than 10 feet each. Each piece of pipe shall be tested by the manufacturer to 600 psi for a minimum of 5 seconds. The bell shall be tested with the pipe. All pipe shall be listed by Underwriter's Laboratories, Inc. and by Factory Mutual as approved for use in underground municipal water distribution systems and private fire protection systems. Ductile iron fittings shall be used with PVC pipe as specified in Paragraph F.

- D. PVC Pipe Less Than 4-inch in Diameter - PVC pipe for lines less than 4-inch in diameter shall conform to ASTM D-2241 and all requirements of Commercial Standard CS-256 for PVC pipe and shall be pressure rated at 200 psi with a standard dimension ratio (SDR) of 21 for both barrel and bell dimensions. The PVC material used in the pipe shall have a cell classification of 12454-B as specified in ASTM D1784. Pipe shall be joined by means of a rubber ring bell joint which shall be an integral and homogeneous part of the pipe barrel. Pipe shall bear the National Sanitation Foundation seal of approval and shall comply with the requirements for Type 1, Grade 1 PVC conforming to all applicable requirements of ASTM D-2241 specifications. Certificates of conformance with the foregoing Specifications shall be furnished with each lot of pipe supplied.

- E. High Density Polyethylene Pipe – High density polyethylene (HDPE) shall be in accordance with AWWA C906 and ASTM F714 as applicable. HDPE pipe shall be manufactured with a PE4710 resin conforming to ASTM D3350 with a cell classification of 445574C/E. All HDPE pipe shall be ductile iron pipe size (DIPS) with a minimum standard dimension ratio (SDR) of 11 unless specified otherwise by Riviera Utilities. All joints shall be butt fused in strict accordance with manufacturer’s recommendations for temperature, pressure and using an approved fusing machine.
- F. Ductile Iron Fittings - Ductile iron fittings shall be designed for pressure rating of 250 psi and shall be in accordance with AWWA Specification C110. Ductile iron compact fittings in sizes 12-inch diameter and smaller shall be designed for a pressure rating of 350 psi, and shall be in accordance with AWWA Specification C153. Fittings shall be mechanical joint or push-on joint. Fittings shall be cement-mortar lined and the exterior coated with a bituminous coating.
- G. Valve Boxes - Cast iron or plastic with C.I. top and cover valve boxes shall be provided for all valves installed vertically and shall consist of a base covering the operating nut and head of the valve, a vertical shaft of at least 5-1/4 inch in diameter, and a top section extending to a point even with the finished ground surface, provided with a cast iron cover painted blue and marked “water”, and placed concentrically over the operating nut.
- H. Valve Stem Extensions - All valves in which the operating nut is greater than 3 feet below the normal ground or road surface, shall be provided with extension stems to bring the operating nut to within 2 feet of the finished grade, but not closer than 1 foot of the finished grade. The extension stem shall be provided with a 2 inch square operating nut on top and a coupling to connect the extension to the operating nut of the valve. A stem guide shall be provided to keep the valve stem extensions concentric with the valve box. Extension stems shall be of the same diameter as the valve stem unless otherwise specified.
- I. Corporation Stops - Corporation stops where required or directed, shall have standard CC Corporation Stop Thread on inlet as specified by AWWA C800, and copper tubing size O.D. outlet suitable for service piping. Corporation stops shall be Mueller H15008-3/4" or Ford F1000-3-Q. Corporation stops may be tapped directly into ductile iron and C900 PVC water mains. Corporation stops shall be tapped into other water mains only by means of a bronze service clamp. Service clamps shall be Mueller H1300 series, Ford S70 series, or equal.

- J. Curb Stops - Curb stops where required or directed, shall be suitable for service piping, and shall be Mueller 300 series, Ford B11 series, or equal.
- K. Pipe for Service Connections - Water service piping shall meet the following requirements:
1. Copper service pipe shall be seamless copper water tube, ASTM B 88, Type K.
 2. Crosslinked polyethylene (PEX) water service pipe shall be manufactured in accordance with AWWA C904 and to SDR9 copper tube size (CTS). PEX water service pipe shall only be used where approved by Riviera Utilities. PEX water service pipe shall be Municipex as manufactured by Rehau Unlimited Polymer Solutions or approved equal.
- L. Tapping Valves and Sleeves - Tapping valves shall meet the requirements set forth for gate valves as described in paragraph O.
1. Tapping sleeves shall be JCM 432 series, Mueller H304 series, Romac "SST III" series, or Ford FTSS series with full wrap around sleeve and gasket, and shall be constructed entirely of stainless steel; including the flange, bolts, nuts, washers, and 3/4 inch NPT test plug.
 2. Tapping valves and sleeves are to be used for making connections to existing mains.
- M. Fire Hydrants - All hydrants shall be Mueller Super Centurion 250, or approved equal, and shall conform with AWWA Standard C502, be Underwriters Laboratories Listed, and Factory Mutual Approved, and shall meet the following specifications:
1. Minimum of 10 year limited warranty on material and workmanship.
 2. 200 lbs. working pressure or 400 lbs. hydrostatic pressure minimum.
 3. One 1½" operating nut that requires a counterclockwise motion to open the valve.
 4. A 6" mechanical joint inlet.
 5. A main valve to be 5¼" minimum, that opens against water pressure and close with water pressure, made of rubber material.
 6. Bronze upper valve plate.

7. two 2½" hose nozzles with 60° V-threads at 7½ T.P.I. (National Standard Threads)
 8. one 4½" pumper nozzle with 60° V-threads at 4 T.P.I. (National Standard Threads)
 9. Factory filled oil reservoir with dual O-rings designed to force oil over stem threads and bearing surfaces when hydrant is operated.
 10. Traffic break away feature.
 11. Epoxy coating on the foot.
 12. Bronze parts in continuous contact with the water supply are to be made of bronze with low zinc content, AWWA Grade 1, or approved equal substitution.
 13. A bury of 3'6" except where otherwise required in the field and/or called for on the plans.
 14. One (1) coat of primer and two (2) finish coats of an outside paint, conforming to Federal Specification TT-P-36A, Type II, Class A, of the color selected by the Utilities Board; which is red. At least one final coat shall be applied after installation of the hydrant.
- N. Flushing Hydrants - Flush hydrants shall be Kupferle Eclipse No. 2, or approved equal, with:
1. 2½ inch nozzle locking cap.
 2. 3 inch mechanical joint inlet.
 3. 3' 6" bury.
- O. Gate Valves - All valves shall be non-rising stem for underground direct burial service and shall close when the operating nut is turned in clockwise rotation. Valves shall be as manufactured by Mueller 2360 series, or approved equal, and be the resilient seat type or equal in accordance with and meet the requirements and recommendations of the latest published AWWA Specification C500. Stem sealing shall be provided by O-Ring packing. Valves shall be furnished complete with necessary gaskets, bolts, nuts as needed for mechanical joint ends.

Mechanical joints and accessories shall comply with the latest published AWWA Specification C111. Gaskets shall be of best grade quality of a type suitable for potable water service. Gate valves shall be required on all pipe sizes up to and including eight (8) inch.

- P. Butterfly Valves - Butterfly valves shall be required on all valves greater than eight (8) inch. Butterfly valves are to be Mueller Lineseal III or approved equal, and shall be manufactured in accordance with the latest revision of AWWA C504 for Class 150B service and meeting the following specifications:
1. General - Butterfly Valves shall be rubber seated for 150 psi minimum working pressure and line velocities up to 16 fps. The operators shall open the valves on a counterclockwise rotation of the operator wrench, and nut which shall be AWWA 2 inch square cast iron. Operators shall be totally enclosed and permanently lubricated for direct burial of the valves and frequent submergence in water up to 20 feet of head. Valve, except for seating, shall be coated in accordance with TT-C-494A and AWWA C504 with an epoxy coating per SSPC-SP10 to a minimum of 7 mils in compliance with AWWA C550.
 2. Valve Bodies - shall be constructed of cast iron ASTM A-126 Class B and conform to AWWA C504 in terms of laying lengths and minimum body shell thickness. End connections shall be as specified on the plans.
 3. Valve Discs - shall be made from cast iron ASTM A-126 Class B. Disc shall be furnished with 316 stainless steel edge to mate with the rubber seat on body.
 4. Valve Seats - shall be Buna N rubber located on the valve body and have bonded seats that meet test procedures outlined in ASTM D-429 Method B.
 5. Valve Shafts - The valves will be installed with the valve shaft in a horizontal position. The shaft conform to stainless steel ASTM A-276 Type 304. Shafts seals shall be standard self-adjusting. Shaft seals shall be of a design allowing replacement without removing the valve shaft.
 6. Valve Bearings - shall be sleeve type that are corrosion resistance and self-lubricating.

7. Valve Actuators - shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft. lbs. The traveling nut shall engage alignment grooves in the housing.
- Q. Anchoring Couplings - Anchoring couplings shall meet the requirements set forth for fittings as described in paragraph F.
- R. Set Screw Retainer Glands - Mechanical joint set screw retainer glands shall be ductile iron retainer glands equipped with hardened, cupped end set screws. Assembly shall be designed for minimum pressure of 250 psi.
- S. Restrained Joint Gland (MegaLug) - Shall be EBAA series 1100 for ductile iron and series 2000PV for PVC, or EBAA series 3100 for both, or equal. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be treated to a minimum hardness of 370 BHN dimensions of the gland shall be such that it can be used with the standard mechanical joint bell and tee head bolt. Romac GripRing for DIPS or IPS shall also be accepted.
- T. Water Service Meter – shall be provided by Riviera Utilities.
- U. Meter Boxes and Covers
1. ¾" Services – Meter boxes and covers shall be standard size Dexol number 1419-12 CIR or Carson DDX1419-12-CIR and shall be constructed of polyethylene structural foam with cover having a hinged cast iron reader lid, marked "water meter", or equal; lids must be interchangeable with Dexol 1419-12 CIR.
 2. 1" Services – Meter boxes and covers shall be large size Dexol number 1419-12 CIR or Carson DDX1419-12-CIR and shall be constructed of polyethylene structural foam with cover having a hinged cast iron reader lid, marked "water meter", or equal; lids must be interchangeable with Dexol 1419-12 CIR.
 3. 1.5" and 2" Services – Meter boxes and covers shall be jumbo size Dexol number 1419-12 CIR or Carson DDX1419-12-CIR and shall be constructed of polyethylene structural foam with cover having a hinged cast iron reader lid, marked "water meter", or equal; lids must be interchangeable with Dexol 1419-12 CIR.

4. 3" and Larger Services – Shall be installed in a concrete vault box with a checker-plated lockable aluminum hatch sized to match the vault box size. It shall include two (2) inline AWWA flanged gate valves. The contractor shall verify the meter dimensions prior to setting the valves to ensure a proper fit. If the meter does not fit properly, the contractor shall reset the valves at no additional cost. It shall also include a bypass line which matches the size of the main/meter. The bypass shall include one (1) AWWA flanged gate valve. The vault box shall be sized such that the valves, meter, and bypass fit within the vault with a minimum clearance of eight (8) inches in all directions.
5. Multiple Meters – Where four (4) or more meters are installed for a single building or development, they shall be installed within a single vault box. The vault box shall be concrete with a checker-plated lockable aluminum hatch sized to match the vault box size. The pipe size and materials shall be approved by the Owner.

V. Meter Yoke

1. ¾" Services – ¾" Meter yoke shall be Ford Line Setter LF LSVBH41-233W-Q-NL, Mueller Company 5/8" x ¾" B2418R-2, or approved equal.
2. 1" Services – 1" Meter yoke shall be Ford Line Setter LSVBH41-444W-Q-NL, Mueller Company B2418R-2, or approved equal.
3. 1.5" Services – 1.5" Meter yoke shall be Ford Line Setter LF VBHH76-12HB-11-66 CSTR, 1.5" x 18" Mueller Company B2423-2-99000, or approved equal.
4. 2.0" Services - 2" Meter yoke shall be Ford Line Setter LF VBHH77-12HB-11-77 CSTR, 2" x 18" Mueller Company B2423-2-99000 with 2" Spacer, or approved equal

W. PVC Fittings - are not permitted.

- X. Marking for PVC Pipe - All PVC pipe shall be marked using a 12 gauge coated copper wire buried between 3 inches and 6 inches above the top of the pipe. The pipe trench shall be backfilled to approximately 3 inches over the top of the pipe then the wire shall be placed over top of pipe. Backfill shall be carefully placed to a depth of 3 inches by hand to assure that the wire is secured in placed over the pipe. It is the intent of this paragraph to provide a means to locate PVC pipe using standard pipe location equipment. The wire shall be carried up on the outside of valve boxes and terminated at least 2

feet above the ground line to permit connecting of location equipment. Excess wire at valve boxes shall be neatly rolled and stored in the valve box for easy accessibility.

- Y. Gravel or Slag Foundation - Gravel or slag shall be screened, washed and shall be 100 percent retained by 1/4 inch screen. One hundred percent shall pass a 1 inch opening and shall be uniformly graded from maximum size to minimum size. Foreign matter shall not exceed 3 percent by weight when dry.
- Z. Concrete - The minimum compressive strength required at 28 days is 3,000 pounds per square inch. Field specimens and laboratory tests shall be made in accordance with the standards of the American Society of Testing Materials. The minimum amount of water shall be used to produce a workable mix and shall not exceed six U.S. gallons per sack of cement.

300.03 INSPECTION

- A. Material at Factory - All materials are subject to inspection and approval at the plant of the manufacturer. All material shall meet the requirements specified. Laboratory tests shall be made showing the material does meet the Specifications. The records of the tests shall be furnished prior to the pipe being laid.
- B. Materials at Delivery Point - During the process of unloading, inspect all pipe and accessories for loss or damage in transit.
- C. Field Inspection - All pipe and accessories shall be laid, jointed, tested for defects and for leakage with pressure in the manner herein specified.
- D. Disposition of Defective Material - All material found during the progress of the Work to have flaws, or other defects will be rejected and promptly removed from the site of the Work.

300.04 HANDLING PIPE AND ACCESSORIES

- A. Care - Pipe, fittings, valves, hydrants, and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project; they shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists

or slid, or rolled on skidways in such manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.

- B. At Site of Work - In distributing the material at the site of the Work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.
- C. Care of Pipe Coating - Pipe shall be handled in such manner that a minimum amount of damage to the coating will result. Damaged coating shall be repaired in accordance with the pipe manufacturer's recommendations.
- D. Bell Ends, How Faced - Pipe shall be placed on the site of the Work parallel with the trench alignment and with bell ends facing the direction in which the Work will proceed.
- E. Pipe Kept Clean - The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Each pipe shall have a swab run through it until all foreign matter has been removed.
- F. Frost Protection - Valves and hydrants before installation shall be drained and stored in a manner that will protect them from damage by freezing.

300.05 ALIGNMENT AND GRADE

- A. General - All pipe shall be laid and maintained to the required lines and grades; with fittings, valves, and hydrants at the required locations; and with joints centered and spigots homes; and with all valve and hydrant stems plumb.
- B. Protecting Underground and Surface Structures - Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the Work shall be furnished.
- C. Depth of Pipe Cover - Depth of pipe cover shall be measured from the proposed or established street grade or the surface of the permanent improvement to the top of the barrels of the pipe.

Pipes 16 inches and larger shall have minimum cover of 48 inches, and pipes smaller than 16 inches shall have minimum cover of 30 inches, except where otherwise noted on the Plans. At street intersections or where the new pipe lines cross existing or proposed underground lines at the approximate same

depth as the new line, the cover shall be increased and the new line laid below the existing or proposed pipe lines. Where the new pipe line crosses existing or proposed ditches, the top of the pipe shall be a minimum of 36 inches below the existing or proposed invert of ditch, whichever is lower, except where noted.

300.06 EXCAVATION AND PREPARATION OF TRENCH

- A. Description - The trench shall be dug to the alignment and depth required and only a minimum distance in advance of pipe laying. The trench shall be so drained that workmen may work therein efficiently. It is essential that the discharge from pumps be led to natural drainage channels to drains, or to storm sewers.
- B. Width - The trench which may vary with and depend upon the depth of trench and the nature of the excavated material encountered, but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of unsheeted trench shall be 18 inches, and for pipe 10 inches or larger, at least 1 foot greater than the nominal diameter of the pipe; the maximum clear width of trench shall be not more than 2 feet greater than the pipe diameter.
- C. Pipe Foundation in Good Soil - The trench, unless otherwise specified, shall have a flat bottom, conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon sound soil cut true and even so that the barrel of the pipe will have a bearing for its full length.
- D. Correcting Faulty Grade - Any part of the trench excavated below grade shall be corrected with approved material, thoroughly compacted.
- E. Pipe Foundation in Poor Soil - When the bottom uncovered at sub-grade is soft and cannot support the pipe, a further depth and/or width shall be excavated and refilled to pipe foundation grade as required.
- F. Bracing - When the material through which the trench is excavated tends to fail in, run, or cave, the sides of the trench shall be braced, open sheeted or closed sheeted, to an extent necessary to protect the pipe being laid. Such sheeting shall remain in place until the backfill is carried to a point at least 2 feet above the top of the pipe. Caution shall be exercised in removing the sheeting in order to avoid damaging the pipe. Should there be evidence that the removal of sheeting would damage the pipe, the sheeting shall be left in place. The top of sheeting left in place shall be at least 12 inches below

natural ground.

- G. Care of Surface Material for Reuse - If local conditions permit their reuse, all surface material suitable for reuse in restoring the surface shall be kept separate from the general excavation material.
- H. Manner of Piling Excavated Material - All excavated material shall be piled in a manner that will not endanger the Work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clean or other satisfactory provisions made for street drainage. Also storm drains shall be kept clear.
- I. Bell Holes Required - Bell holes of ample dimensions shall be dug in earth trenches at each joint to permit the jointing to be made properly.
- J. Trenching By Machine or By Hand - The use of trench-digging machinery will be permitted, except in places where operation of same will cause damage to trees, buildings, or existing structures above or below ground, in which case hand methods shall be employed.
- K. Barricades, Guards, and Safety Provisions - To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns, and guards as required shall be placed and maintained during the progress of the construction Work and until it is safe for traffic to use the trenched highway. Rules and regulations of the local authorities respecting safety provisions shall be observed.
- L. Traffic and Utility Controls - Excavations for pipe laying operations shall be conducted in a manner to cause the least interruptions to traffic. Where traffic must cross open trenches, suitable bridges shall be provided at street intersections and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire or police call boxes, or other utility controls shall be left unobstructed and accessible during the construction period.
- M. Flow of Sewers and Drains Maintained - Adequate provisions shall be made for the flow of sewers, drains, and water courses encountered during construction, and the structures which may have been disturbed shall be satisfactorily restored upon completion of the Work.
- N. Property Protection - Trees, fences, poles, and all other property shall be protected unless their removal is authorized; and any property damaged shall be satisfactorily restored.
- O. Interruption of Water Service - No valve or other control on the existing system shall be operated for any purpose without approval of the Utilities

Board, and all customers affected by such operation shall be notified at least one hour before the operation and advised of the probable time when the service will be restored.

300.07 PIPE LAYING

- A. Manner of Handling Pipe and Accessories Into Trench - Proper implements, tools and facilities shall be provided and used for the safe and convenient prosecution of the Work. All pipe, fittings, valve, and accessories shall be carefully lowered into the trench, piece by piece, by means of derrick, ropes or other suitable tools or equipment, in such manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
- B. Pipe Kept Clean - All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.
- C. Laying the Pipe - After placing a length of pipe in the trench, the joint shall be held around the bottom of the spigot, so that it will enter the bell as the pipe is shoved into position.

The spigot shall be centered in the bell, the pipe shoved into position, and brought into true alignment; it shall be secured there with earth carefully tamped under and on each side of it, except at the bell holes. Care shall be taken to prevent dirt from entering the joint space.

- D. Preventing Trench Water from Entering Pipe - At times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means, and no trench water shall be permitted to enter the pipe.
- E. Cutting Pipe - Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe.
- F. Bell Ends to Face Direction of Laying - Pipe shall be laid with bell ends facing in the direction of laying. For lines on an appreciable slope, bells shall face upgrade.
- G. Permissible Deflection at Joint - Whenever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions, to plumb stems, or where long radius curves are permitted, the degree of

deflection shall be in accordance with the pipe manufacturer's recommendations.

- H. Railroad and Highway Crossing - When any railroad or highway is crossed, all precautionary construction measures required by the railroad and highway officials shall be followed, and steel or DI pipe shall be used as casing.
- I. Unsuitable Conditions for Laying Pipe - No pipe shall be laid in water, or when the trench conditions or weather is unsuitable for such work.
- J. Existing Open Cut Pavement or Proposed Roadway - All roadway crossings existing or proposed shall be bored with encasement pipe, ductile iron pipe, or excavated and supplied with ductile iron pipe extending five (5) feet from edge of roadway for open cut procedure refer to the backfill under pavement section 300.15, paragraph D for compaction requirements.

300.08 JOINTING PIPE

Mechanical and push-on joints shall be installed in strict accordance with the recommendations of the joint manufacturer.

300.09 SETTING VALVES, VALVE BOXES, FITTINGS, AND BLOW-OFFS

- A. General - Gate valves and pipe fittings shall be set and jointed to a new pipe in the manner heretofore specified for cleaning, laying and jointing pipe.
- B. Valve Boxes - Cast iron or plastic with cast iron top and cover valve boxes shall be firmly supported and maintained, centered and plumb over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or at such other level as may directed. Where valve is located outside of paved area, a concrete valve box collar shall be provided as shown on standard detail drawing.
- C. Back-Siphonage to be Prevented - Drainage branches or blow-offs shall not be connected to any sewer or submerged in any stream or be installed in any other manner that will permit back-siphonage into the distribution system.

300.10 SETTING HYDRANTS

Unless otherwise directed, the setting of any hydrant shall conform to the following.

- A. General Location - Hydrants shall be located at the specified height called for by the manufacturer, and in a manner to provide complete accessibility, also in such manner that the possibility of damage from vehicles or injury to pedestrians will be minimized.
- B. Location Re-Curb Lines - When placed behind curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than 18 inches nor more than 30 inches from the gutter face of the curb, or less than 20 feet from the curb line intersection of any street.
- C. Location Re-Sidewalk - When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 12 inches of the sidewalk.
- D. Position of Nozzles - All hydrants shall stand plumb, and shall have their nozzles parallel with or at right angles to the curb with the pumper nozzle pointing normal to the curb except that hydrants having hose nozzles at an angle of 45 degrees shall be set normal to the curb. They shall conform to the established grade, with nozzles at least 12 inches above the ground.
- E. Connection to Main - Each hydrant shall be connected with restrained joint glands to the main pipe with a 6 inch ductile iron or C900 PVC branch to the hydrant valve located on the anchoring tee. Each fire hydrant shall be controlled by an independent 6 inch gate valve which shall be located on the outlet of the anchoring tee, except where directed in the field.
- F. Drainage at Hydrant - Whenever hydrants are set in impervious soil, a drainage pit 2 feet in diameter and 2 feet deep shall be excavated below each hydrant and filled compactly with coarse gravel or broken stone mixed with coarse sand, under and around the bowl of the hydrant and to a level 6 inches above the hydrant's drain opening. No hydrant drainage pit shall be connected to a sanitary sewer.

- G. Anchorage for Hydrant - The bowl of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing, and it shall be tied to the main retainer glands as described in Section 300.02, paragraph S. In no case shall the waste opening be obstructed from free drainage.
- H. Cleaning - Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

300.11 TAPPING OF WATER MAINS

Without exception, when tapping an existing water main all exposed surfaces shall be swabbed with a chlorine solution per section 300.16, paragraph K; including but not limited to the tapping sleeve, tapping valve, and the tapping machine with its cutting devise.

- A. Main Extensions - Tapping of existing water mains shall be performed where such taps are required for connection of new lines to existing lines. These taps shall be made using approved potable water main tapping machines for proper installation of tapping valves and tapping sleeves specified in Section 300.02, paragraph L.1 and L.2, utilizing the tapping process specified by the tapping machine manufacturer.
- B. Services and Test Points - Tapping water mains shall not be performed until new lines have passed hydrostatic testing in accordance with these Specifications section 300.14. Whether tap will be used for a testing point or for a service, the required tapping process is dictated by the specifications set forth by the manufacturer of the tapping machine, and the machine must be an approved tapping device for use with corporation plugs specified in Section 300.02, paragraph I.

300.12 PLUGGING DEAD ENDS

Standard plugs shall be inserted into the bells of all dead ends of pipes, tees, or crosses, and spigot ends shall be capped or plugged. Plugs or caps shall be jointed to the pipe or fittings in the appropriate manner. Dead end lines shall be a minimum 10 feet ductile iron with concrete anchor block poured around pipe meeting the schedule for dead ends found in the appendix or on other plans.

300.13 ANCHORAGE OF BENDS, TEES, AND PLUGS

- A. Limiting Pipe Diameter and Degree of Bend - Reaction or thrust backing shall be applied on all pipe lines 4 inches in diameter or larger at all tees, plugs, caps and at bends deflecting 22-1/2 degrees or more, and movement shall be prevented by attaching mechanical joint retainer glands as described in paragraph S, rust proof tie rods, or other approved anchorage as indicated on the plans. Tie rods shall only be used with prior approval and shall be coated with no-oxide grease after installation.
- B. Material for Reaction Backing - Reaction or thrust backing shall be of concrete of a mix not leaner than 1 cement, 2½ fine aggregate, 5 coarse aggregate, having compressive strength of not less than 2,000 psi. Backing shall be placed between solid ground and the fitting to be anchored. The minimum area of bearing on pipe and on ground shall be as shown on the plans. The backing shall be so placed that the pipe and fitting joint will be accessible for repairs.
- C. Retainer Glands, Grip Rings or MegaLugs - Mechanical joint retainer glands of adequate strength to prevent movement shall be used where directed or required for restraint of joints. Mechanical joint retainer glands shall be as specified in Section 300.02 paragraph R and S.

300.14 HYDROSTATIC TESTING

- A. General - After the pipe has been laid and backfilled as specified and before any service taps installed, all newly laid pipe, or any valved section of it shall, unless otherwise specified, be subject to hydrostatic testing, which shall include pressure testing and leakage testing. Hydrostatic testing shall conform to all requirements of the Alabama Department of Environmental Management. Hydrostatic testing shall also conform to the requirements of AWWA C600, unless otherwise specified herein. Test shall be limited to a maximum length of one (1) mile sections of pipe, unless approval for longer sections is obtained from the Board.
- B. Test Pressure - For all mains, the test pressure shall be at least 150 psi at the low point of the test section and shall not be less than 125 psi at the highest point along the test section, and shall not exceed pipe, valve, or thrust restraint design pressures. The pressure shall not vary by more than ± 3 psi throughout duration of the test.

- C. Pressurization - Each section of pipe shall be slowly fitted with water and the specified test pressure, measured at the lowest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner.
- D. Air Removal - Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, corporation stops shall be installed at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation stops shall be closed and the test pressure applied. After pressure testing, the corporation stops shall be removed and plugged or corporation stops shall be capped with an approved cap.
- E. Duration of Pressure Test - The duration of each pressure test shall be six (6) hours.
- F. Recording Pressure Gauge - A chart recording pressure gauge shall be used during the pressure test. Charts shall be turned over to the Utilities Board.
- G. Examination - Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Utilities Board.
- H. Leakage Testing - Suitable means shall be provided for determining the quantity of water lost by leakage under normal operating pressure. No pipe installation will be accepted until or unless this leakage (evaluated on a pressure basis of 150 psi) is less than allowed in the following formula:

$$L = \frac{SD(P)^{1/2}}{133280}$$

Where:

L = Allowable leakage in gallons per hour

S = Length of pipe tested in feet

P = Average test pressure during the leakage test, in psi

D = Nominal diameter of the pipe, in inches

The allowable leakage limits as specified will apply for both ductile iron and PVC pipe.

- I. Leakage Defined - Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain pressure within 3 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled.
- J. Acceptance of Installation - No pipe installation will be accepted unless leakage is within the limits specified herein. If any test of pipe laid discloses leakage greater than that specified, locate and make repairs as necessary until the leakage is within the specified allowance.
- K. Visible Leaks - All visible leaks shall be repaired, regardless of the amount of leakage.
- L. Scheduling of Testing - Pipe may be subjected to pressure testing and leakage testing at any convenient time after partial completion of backfill. Section of water lines adjacent to existing water lines that are in service shall be chlorinated, flushed and checked for absence of bacteria before the new section of line can be pressure tested. Pressure testing the line before chlorination will be permitted, provided the new line is not connected to the existing line during the pressure test. This procedure is set forth to prevent contaminated water or water with high chlorine content from being forced into a line in service through a faulty valve or other defect during pressure tests.

300.15 BACKFILLING

A. General

1. Before backfilling any trench, examine the completed line and all joints and correct any deficiencies that exist.
2. No trenches or excavations shall be backfilled until concrete in the structures placed therein has acquired a suitable degree of hardness, and the work shall be prosecuted expeditiously after it has commenced.
3. After the pipe has been installed, selected material from the excavation shall be placed alongside the pipe in layers not exceeding 4 inches in depth. Select material shall be as specified above for filling undercut. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted by hand tamping with iron tampers, the tamping face area of which shall not

exceed 50 square inches, to not less than 90 percent maximum density as determined by AASHTO T-99. This method of filing and compacting shall be continued until the fill has reached a depth of at least 6 inches above the top of the pipe. All material shall be deposited carefully in the trench to avoid damaging the water line. The operation of heavy equipment shall be conducted so that no damage to the pipe will result.

4. The remainder of the trench above an elevation of 6 inches higher than the top of pipe shall be backfilled uniformly in layers not exceeding 6 inches in thickness. Mechanical backfilling will be permitted providing material being placed with dragline or crane has a free fall of not greater than 1 foot from the bucket. Each 6 inch layer shall be completed by mechanical tamping except as hereinafter permitted.
- B. Sand - Flooding or jetting will be permitted or required where the clay and silt content of the backfill material is low enough to permit this method of consolidation. Where allowed, this method will be used from a point 6 inches above the top of pipe to the original ground line.
 - C. Muck - Flooding or jetting will be permitted or required where the clay and silt content or water content is so high as to make tamping ineffective. Flooding or jetting will be confined to that portion of the trench starting 6 inches above the top of pipe and ending 2 feet below the original ground surface. The last 2 feet shall be backfilled with selected earth and shall be mechanically rolled or tamped to the degree of compaction of the surrounding ground.
 - D. Backfill Under Pavement - Backfill under all existing or proposed pavement for street, sidewalks or roadways up to the existing grade or proposed grade, whichever is lower, and to a minimum distance of 10 feet adjacent to existing or proposed pavement, shall be in accordance with the latest edition of the Alabama Highway Department Specifications, except for compensation. Where pavement is not to be replaced, the top 6 inches of backfill shall be of a select granular material.
 - E. Fields and Open Country - The backfill above a point 6 inches above top of pipe shall be placed in trench until full. The remaining earth shall be placed on top of the trench and dressed until it settles. At the completion of the job, all excess dirt shall be leveled and disposed of.

300.16 CHLORINATION OF COMPLETED PIPE LINE

- A. General - Before placing into service, all new water distribution systems, or extensions to existing systems, or any valved section of such extension or any replacement in the existing water distribution system shall be chlorinated in accordance with AWWA C651-92 standard for disinfecting water mains.

Any of the following methods of procedure shall be followed, subject to the approval of the Engineer.

1. Liquid chlorine gas-water mixture
 2. Direct chlorine feed
 3. Calcium hypochlorite tablets and water mixture
- B. Preliminary Flushing - Prior to chlorination, all dirt and foreign matter shall be removed by a thorough flushing through the hydrants, or by other approved means. Each valved section of newly laid pipe shall be flushed independently.
- C. Liquid Chlorine - A chlorine gas-water mixture shall be applied by means of a solution-fed chlorinating device, or, the gas shall be fed directly from a chlorine cylinder equipped with proper devices for regulating the rate of flow and the effective diffusion of gas within the pipe. (Chlorination with the gas-water mixture is preferred to direct feed.)
- D. Point of Application - The preferable point of application of the chlorinating agent shall be at the beginning of the pipe line extension, or any valved section of it, and through a corporation stop insertion in the vertical axis of the new laid pipe. The water injector for delivering the gas-water mixture into the pipe shall be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipe line extension. In a new system, application may be at the pumping station, or the elevated tank, or the standpipe, or the reservoir, if available. If a supply of water is not available, the water shall be hauled by tank truck or other means.
- E. Rate of Application - Water from the existing distribution system or other source of supply shall be controlled to flow very slowly into the newly laid pipe line during the application of chlorine. The rate of chlorine gas-water mixture flow shall be in such proportions to the rate of water entering the pipe that the chlorine dose applied to the water entering the newly laid pipe shall be at least 25 PPM. But not more than 50 PPM.
- F. Retention Period - Treated water shall be retained in the pipe long enough to

destroy all non-spore-forming bacteria. This period shall be at least 24 hours and preferably longer as may be directed. After the chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at other representative points shall be at least 25 PPM.

- G. Chlorinating Valves and Hydrants - In the process of chlorinating newly laid water pipe, all valves and other appurtenances shall be operated while the pipe is filled with the chlorinating agent.
- H. Final Flushing and Test - Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length has been tested to confirm the chlorine level is at system residual. Bacteriological samples shall be taken by the contractor and witnessed by Board personnel. Follow-up samples shall be taken not less than 24 hours from the original samples but not more than 36 hours. Sampling points shall be at intervals not to exceed 1,200 linear feet and one at each dead end.
- I. Repetition of Procedure - Should the initial treatment prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the newly laid pipe conforms to the requirements of paragraph H above.
- J. Calcium Hypochlorite or Chlorinated Lime in Water - On approval, a mixture of either calcium hypochlorite or chlorinated lime of known chlorine content and water may be substituted as an alternative for liquid chlorine.
 - 1. Calcium hypochlorite tablets or mixture (comparable to commercial products known as "HTH", Perchloron", and "Maxochlor"); or
 - 2. Chlorinated lime (frequently called chloride of lime and known to industry as bleaching powder), may be used.
- K. Proportions of Calcium Hypochlorite or Chlorinated Lime and Water Mixtures - A 5 percent solution shall be prepared, consisting of 5 percent of either powder to 95 percent of water by weight.
- L. Application - This calcium hypochlorite or chlorinated lime and water mixture, first made into a past and then thinned to a slurry, shall be injected or pumped into the newly laid pipe under conditions heretofore specified for liquid chlorine application, after preliminary flushing.

- M. Approval - Provisions for final flushing, testing, and approval under this alternative shall be the same as those described previously.
- N. Procedure When Cutting Into Existing Pipe Lines - Cuts made in existing pipe lines for the insertion of valves, fittings, repairs, or for any other purpose shall be chlorinated by shaking a predetermined quantity of the powder into the pipe on each side of the cut-in. After slowly filling the section and reversing the flow, the chlorinated water shall be retained for several hours, then flushed until no odor of chlorine can be detected in the flushing water, or preferably until a check shall have been made for residual chlorine as provided for herein.
- O. Resumption of Service - After satisfactory chlorination by any of these alternative procedures, the consumer may be served from the newly laid pipe line or the service may be resumed on existing pipe lines after authorization is received from the Alabama Department of Environmental Management.

300.17 CLEAN-UP

Where these operations are on city, state, county, or private property, the job shall be kept clean at all times. Loose dirt shall not be allowed to clog ditches or cover sidewalks. Soft clay or other undesirable material removed from the trenches shall be removed from the streets, sidewalks, or ditches.

300.18 ENCASEMENT PIPE

- A. General - Encasement pipe shall conform to AASHTO Standards and Alabama Highway Standards where placed under highways and to area standards where placed under railroads. Encasement pipe shall be installed by a dry boring method in which the casing pipe is placed simultaneously with the boring action, thus eliminating the possibility of cave-ins'.

Roadways, railroad tracks or other facilities directly above the Work shall be inspected before, during, and after the placing of the encasement for any shifting, settlement, or other damage. If settlement occurs that damages a paved surface, the Contractor shall repair the pavement in accordance with the requirements of ALDOT or other controlling authority at no additional cost to the OWNER. If settlement damages a railway, the track shall be repaired to its original alignment and condition by the means required by the

operator of the railway at no additional cost to the OWNER.

All pipes installed within encasement pipe shall have restrained joints and not be allowed to rest on the pipe bells. Encasement pipes shall have an inside clear dimension of at least two (2) inches greater than the maximum outside dimension of the carrier pipe bell or the mechanical joint restraints.

- B. Welded Steel Encasement Pipe shall conform to ASTM Designation A-252, Grade 2. The pipe shall be coated on the outside only with a coal tar primer coat followed by a single application of hot coal tar enamel 3/32 inches thick \pm 1/32 inches.
- C. Encasement Spacers – Encasement spacers shall be stainless steel lined with EDPM rubber as manufactured by CCI Pipeline Systems, or approved equal.
- D. Encasement Pipe End Seals – The ends of encasement pipe shall be sealed with approved rubber end seals having stainless steel clamping bands. Masonry plugs shall not be used unless approved by the OWNER.

300.19 GRASSING AND MULCHING

All areas disturbed by construction shall be grassed and mulched as hereinafter specified.

- A. General - The area to be grassed shall be graded to the final grade and roots, stumps or other materials which might be harmful to grass growth shall be removed and disposed of. Care shall be taken to spread topsoil over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.
- B. Fertilizer - After the surface has been prepared for grassing and before any grass or seeds are planted, the soil shall be loosened by harrowing or other approved methods, and the areas specified to be grassed shall be fertilized at a uniform rate of 1,500 pounds per acre with a standard commercial 8:8:8 fertilizer and 3,000 pounds of agricultural lime per acre.
- C. Seeding - The areas to be grassed shall be seeded with good sound seed in the following minimum quantities per acre:

1. Pensacola Bahia	20 pounds
2. Kentucky 31 Fescue	34 pounds
3. Common Bermuda	10 pounds
4. White Dutch Clover	10 pounds

In some areas, it may be necessary to vary the concentrations of various seed to suit local conditions and the Utilities Board reserves the right to require to change proportions of the various seed so long as the total amount of seed does not exceed 74 pounds per acre at no change in Contract price.

Seeds shall be broadcast with hand operated equipment, such as a "Cyclone" feeder, Seymour "Seedkaster," or equivalent. When broadcast, seed shall be sown over the areas and raked or dragged and covered to the desired depth. Hydro seeding may be used in lieu of the above.

- D. Mulching - Where directed, the surface of sprigged and over seeded slopes of the roadway or embankments shall be protected by the application of a mulch. The mulch shall be spread uniformly in a continuous blanket by hand or by suitable approved equipment, at a rate of 2 tons to the acre. Mulching material which is too coarse or too short for proper securing in the surface soil will be rejected. Mulching shall be started at the windward side of relatively flat areas or at the upper part of a steep slope and continued uniformly over the entire area. The mulch material shall be anchored to the soil by spraying a light coating of emulsified asphalt over the straw or hay after these materials have been placed. The asphalt shall be applied by hand sprayers attached by hoses to an asphalt spreader or other approved methods. The asphalt adhesive shall be applied to the mulch at a rate of 150 gallons of undiluted (straight emulsion) asphalt per ton of straw or hay (300 gallons per acre). If the straight emulsion is further diluted with water in the ratio of 60 (straight emulsion) to 40 (water), the application rate shall be 250 gallons of asphalt emulsion per ton of straw or hay (500 gallons per acre). The purpose of the asphalt adhesive is to secure the mulch on the ground to form a soil binding mulch and prevent loss or bunching by wind or water.
- E. Maintenance - Maintain all grassed areas until acceptance of the utilities and for a period of 3 months thereafter. In areas upon which an established stand of grass is not obtained, reseeding and remulching shall be required. A satisfactory stand of grass is defined as a cover of living grass in which gaps larger than 12 inches do not occur at the time of acceptance. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area until final acceptance.

If the grassing operation is accomplished after the month of August or before the month of March, in addition to the seeding as outlined above, the entire grassed areas shall also be over seeded with Italian Rye grass seed at the uniform rate of 40 pounds per acre at no additional cost to the Utilities Board.

- F. Asphaltic Adhesive - Asphalt shall be a bituminous soil cover suitable for mulching of seeded areas and shall contain no petroleum solvents or other diluents which would be toxic to plant growth. It shall be a homogeneous emulsification of especially refined petroleum asphalt suitable for spray application with or without dilution with water. Laykoid Soil Cover, manufactured by American Bitumuls and Asphalt Company, or other commercial types of asphalt specifically designed for mulching of seeded areas for erosion protection against rain or wind, will be acceptable.

300.20 REMOVING AND REPLACING PAVEMENT

- A. Any paved streets cut by these operations shall be repaved in a workmanlike manner and restored to their original condition as specified. The paving shall be of material equal to that removed and shall be laid in accordance with the Utilities Board's current Standard Specifications covering the type of paving. Where paved streets are cut, reef shell shall be provided immediately following backfill, and such crossing shall be maintained until repaved.
- B. When flexible pavement is replaced, an 8 inch minimum thickness sand-shell base course shall be constructed full width of the trench to the finish grade as detailed and noted. After base has been compacted, a bituminous prime coat shall be applied at the rate of approximately 0.2 gallons per square yard of cut-back asphalt and the trench shall be paved with 1-1/2 inches of hot asphaltic concrete. The paved surface shall be finished flush with the existing pavement and shall conform to the existing contour of street or roadway.
- C. Where concrete or other types of pavement are removed, they shall be replaced with the same type and thickness as that removed. Just prior to repaving, jagged edges shall be squared and cut to a string line so that the patch will present a neat appearance.
- D. Pavement markings shall be replaced at no change in Contract price.
- E. Prior to excavation in paved streets or other paved areas, the pavement shall be cut along straight and perpendicular lines parallel to the center line of the pipe.
- F. For those areas where the pipe trench crosses at right angle or other angles to the center line of the road or street, except those crossings included within limits of complete resurfacing, pavement replacement shall be as specified above with modifications as hereinafter specified. Just prior to

placing of the wearing layer, the existing pavement on each side of the trench line shall be stripped off for a distance of 10 feet, terminating in a straight line. The existing base course shall then be shaped to conform to the contour of the roadway and primed. After curing, the wearing layer shall be constructed to the thickness of the original pavement or 100 pounds per square yard whichever is greater. In no case shall this pavement replacement be less than 22 feet long measured along the center line of the roadway or street.

300.21 PAVEMENT REPLACEMENT, CONCRETE SIDEWALK OR DITCH PAVING

Where concrete pavement in streets, sidewalks, paved ditches or other areas is removed, it shall be replaced with the same type and thickness as that removed including finish. A 6 inch compacted thickness sand-shell or sand-clay base course shall be provided under new concrete paving subject to vehicular traffic as specified above. Existing pavement shall be cut back a minimum of 9 inches from edge of trench to provide an undisturbed foundation for the concrete replacement.