

SECTION 1402

CONCRETE CYLINDER PIPE

1402.0100 GENERAL

1402.0101 Description of Work. The work under this section shall consist of furnishing and installing concrete cylinder pipe and all fittings and appurtenances required, in accordance with the details shown on the plans, the special specifications, and the requirements of these specifications and contained in the approved materials list (Appendix A).

1402.0103 Submittals.

Shop drawings shall be submitted for all pipe, flanges, specials, and fittings. A tabulated pipe layout schedule and design calculations shall be submitted for approval to the Engineer prior to fabrication of pipe or appurtenances.

All submittals shall reference the Tucson Water project plan number.

The manufacturer's drawings shall indicate the location of each piece by mark number for the entire job, pipe locations, dimensions, cathodic protection coating, bonding clips, joint configuration, details, gasket size, fittings and specials, thrust restraint, steel cylinder thickness, bar reinforcement diameters and splicing for each diameter, pressure class, and maximum depth of cover.

The contractor must verify the accuracy of all shop drawings. If errors are discovered, work will be stopped until corrected. The contractor is responsible for all shop drawing errors. All submittals shall be furnished to the Agency by the contractor within fourteen working days after Notice to Proceed. The Agency will review the submittals for general conformance with approved plans and specifications. Agency approval of the submittals shall not in any way relieve the contractor of the responsibility for completeness, accuracy, errors, and omissions.

1402.0104 Delivery, Storage and Handling. Concrete cylinder pipe and appurtenances shall be delivered to the site, stored and handled in accordance with the manufacturer's instructions except as modified by the plans, special specifications or as directed by the Engineer. During shipment and storage the pipe ends shall be securely covered. Pipe delivered to a project without the ends covered will be rejected and removed from the site. Cleaning of contaminated pipe is not allowed.

The interior surface of each length of concrete cylinder pipe shall be legibly marked by the manufacturer with the design pressure, maximum depth of cover and the date of application of the cement mortar coating. The marking shall also indicate the piece number installation or proposed location for each length. No markings or multiple markings will be cause for rejection.

Lengths of beveled pipe shall be marked on the beveled end with the degree of bevel, the point of maximum pipe length at the spigot end, and the field top.

All markings shall be made with a non-toxic waterproof marking material.

The manufacturer shall repair any damage to the cathodic protection coating prior to installation of the pipe. All repairs must be approved by the engineer.

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1402.0200 PRODUCTS

1402.0201 Materials.

(A) **Concrete Cylinder Pipe.** Concrete cylinder pipe shall consist of a welded steel cylinder, a centrifugally cast concrete or cement-mortar lining, a continuous mild-steel reinforcing bar helically wrapped around the cylinder, a dense cement-mortar coating over the steel cylinder and bar reinforcement, and sized steel rings welded to the cylinder to form a self-centering bell and spigot joint sealed by a compressed rubber gasket. Concrete cylinder pipe shall comply with standards shown in the Appendix B.

(B) **Pressure Requirements.** Concrete cylinder pipe shall achieve the design pressure requirements specified herein. The working pressure requirement specified on the plans or in the special specifications does not include an allowance for transient conditions and surge pressures. The design procedure shall be based on both design and surge hydrostatic pressures being resisted by the tensile stress capacity of the steel cylinder and circumferential steel bar. External loads on buried concrete cylinder pipe are to be resisted by the ring flexural strength of the pipe and the passive earth pressure on the sides of the pipe. Steel tensile stresses and maximum pipe deflections shall not exceed the limits established by AWWA C303.

The working pressure shall be as identified on the approved plans. The design pressure shall equal the working pressure times 1.25. Test pressure shall equal the design pressure. All pipe and fittings shall be designed to withstand a full vacuum. The contractor shall pressure test all new work.

The contractor shall submit for approval details for a method to cap both ends of the new pipe sections prior to making final connections to existing pipe. Submittals shall include details on thrust restraining methods for the capped ends. Use of bulkheads inside the pipe that must be cut out after testing will not be acceptable. Following successful pressure and bacteria testing, the contractor shall remove the capped ends and connect the new pipeline to the existing pipeline.

Tests may be made against existing valves, on permission from the Agency, with the understanding that they are made at contractor's risk and that he is responsible for any damage to existing lines or valves or other caused by the test. The Agency assumes absolutely no obligation of any kind for the condition of existing facilities and any connection the contractor makes to these facilities for testing is done at the contractor's risk.

(C) **External Load Considerations.** Pipe deflection under the external load shall not exceed $D/4000$, where D is the nominal pipe diameter. External loads shall be calculated using a transition width trench plus HS-20 traffic loading. The unit weight of the backfill material shall be 120 pounds per cubic foot and the $K\mu'$ soil factor shall be 0.150. The ring deflection shall be calculated from "Spangler's Formula" using a deflection lag factor of 1.25, a bedding constant K of 0.100, a soil modulus E' of 700, and a settlement projection ratio of 0.3.

(D) **Fabrication.** The manufacturer shall furnish concrete cylinder pipe within a standard laying length ranging from 24 to 40 feet. The manufacturer shall designate the standard length to be furnished and all pipe provided shall be uniformly of that length.

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The minimum thickness of exterior cement mortar coating shall be 1 inch over the steel cylinder or 3/4-inch over the bar reinforcement whichever provides the greatest nominal coating.

The thickness of cement mortar interior lining shall be one half inch for pipe diameters ten inch through 16 inch and three quarter inch for diameters twenty four inch and larger. The allowable tolerance for the cement mortar linings shall be one eighth inch.

1402.0300 EXECUTION

1402.0301 General. Concrete cylinder pipe shall be furnished with a self-centering steel bell and spigot joint sealed with a confined rubber gasket. Blind flanges shall be steel.

1402.0302 Installation.

(A) **General.** Installation of concrete cylinder pipe shall conform with the applicable requirements of AWWA Manual M9 -Concrete Pressure Pipe and Section 0209 of these Standard Specifications.

(B) **Workmanship.** All personnel of the contractor or his/her subcontractors shall be skilled and knowledgeable with regard to the installation procedures for the pipe, fittings and appurtenances being installed.

(C) **Shipping and Storage.** During shipment and storage the ends of the pipe shall be securely covered.

(D) **Thrust Restraint.** The contractor shall provide thrust restraint in accordance with the provisions of Section 1406. Welded joint restraint shall be in accordance with the manufacturer's recommendations as may be modified herein. The welded length of pipeline and the size and type of weld shall comply with the requirements of the approved plans and the special specifications.

(E) **Joint Bonding.** The pipe joints shall be bonded with bonding cables or bonding clips which are welded to the joint rings on the exterior pipe in accordance with the manufacturers recommendations. Joints that have been welded to counteract thrust forces will not require bonding cables or bonding clips. Joints which are specified on the approved plans to have flange insulation kits or other electrical isolation methods shall not be bonded. After installation of the bonding cables or bonding clips, the recess provided to accommodate this installation shall be filled with a cement-mortar grout which is confined by a polyethylene foam lined grout band.

Joint bonding and corrosion monitoring shall be in accordance with applicable portions of Standard Details SD700-SD710. The contractor shall provide bonding cable or bonding clip calculations for approval by the Agency prior to beginning construction.