

Steel Pipe

1. SCOPE

The work shall consist of furnishing and installing steel pipe complete with coatings, fittings and appurtenances as specified on the drawings, specifications and special provisions.

2. MATERIALS

Pipe and Fittings

Steel pipe and fittings shall conform to the requirements of the applicable specifications listed below:

ASTM A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 134 Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over)

ASTM A 135 Electric-Resistance-Welded Steel Pipe

ASTM A 139 Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)

ASTM A 211 Spiral-Welded Steel or Iron Pipe

AWWA C200 Steel Water Pipe 6 Inches or Larger

AWWA C207 Steel Pipe Flanges

Appurtenances

Standard fittings shall be used for the pipe. Elbows, tees, crosses, reducers, gate valves,

check valves, air and vacuum release valves, pressure-relief valves, and pressure regulators shall be of the size and material specified or as shown on the drawings. Steel supports and saddles shall be constructed of material that equals or exceeds the requirements specified in ASTM A-36, "Structural Steel."

Coatings

Coatings shall conform to the requirements of the following specifications for the specified type of coating:

AWWA C203 Coal-Tar Protective Coatings and Linings for Steel Water pipelines--Enamel and Tape--Hot Applied

AWWA C205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4 Inches or Larger--Shop Applied

AWWA C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.

AWWA C210 Liquid Epoxy Coating Systems For the Interior and Exterior of Steel Water Pipelines

AWWA C214 Tape Coating Systems for The Exterior of Steel Water Pipelines

Anodes

Zinc anodes must meet or exceed the requirements specified in ASTM B-418, "Cast and Wrought Galvanic Zinc Anodes."

Each anode shall have a full length core with a single strand of insulated copper wire solidly attached to it. The wire shall be No. 12 or larger. If a header wire is used, the gage must be adequate to carry the design current with no more than a 20-mV I-R drop.

All anodes shall be commercially packaged. The packaged backfill mix shall be of the following proportions by weight:

Zinc
20 to 30 pct. bentonite;
70 to 80 pct. gypsum

Magnesium
20 to 25 pct. bentonite;
70 to 75 pct. gypsum;
5 pct. sodium sulfate

3. COATING APPLICATIONBuried Pipelines

Unless otherwise specified in the special provisions, all steel pipe and fittings shall be interior and exterior coated. Pipe shall be coated in accordance with AWWA Standard C203, 210, or 214. Fittings shall be coated in accordance with AWWA standard C203, C209, or C210.

Aboveground or Onground Pipelines-- Paint Coating

Aboveground or onground pipe and fittings shall be exterior painted. Unless otherwise specified, the painting system shall be as follows:

Surface Preparation. Surfaces to be painted shall be thoroughly cleaned prior to the application of paint. Surface preparation required by this specification is as designated by SSPC-SP7 (Steel Structures Painting Council). The procedure is summarized as follows:

Brush Off Blast Cleaning. Surfaces to be coated shall be prepared by removing all visible oil, dirt, dust, loose mill scale, loose rust and loose paint by sand or grit air blasting. Tightly adherent mill scale, rust and paint may remain on the surface. Mill scale, rust and paint are considered highly adherent if they cannot be removed by lifting with a dull putty knife. Oils, grease or other soluble contaminants shall first be removed by solvent cleaning.

Primer Coat. One coat of primer consisting of a single package moisture cured urethane primer shall be applied. Urethane primer shall have a minimum of 50 percent solids by volume. Primer shall be able to be applied at 2.0 to 3.0 mils DFT in one coat. Color shall be metallic aluminum.

Final Coat. Minimum of one coat of Acrylic Polyurethane (semi-gloss) or (gloss). The color shall be as specified on the drawings or special provisions. Acrylic polyurethane shall be lead free. Acrylic Polyurethane shall have a minimum of 58 percent solids by volume for semi-gloss or 74 percent solids for gloss. Polyurethane shall be able to be applied at 3.0 to 5.0 mils. DFT in one coat.

4. LAYING AND BEDDING THE PIPE

Buried Pipelines

Pipe shall be laid to the lines and grades as shown on the drawings and/or as staked in the field and shall be placed deep enough below the land surface to protect it from the hazards imposed by traffic crossings, farm operations, freezing temperatures, or soil cracking. The cover shall be a minimum of 2 feet, but in soils susceptible to deep cracking, the cover shall be a minimum of 3 feet. If necessary to install the pipe at a lesser depth, adequate protection shall be provided by placing extra fill over the pipeline, constructing a fence or other surface barriers, or using extra heavy gage pipe.

If trenches are excavated in soils containing rock or other hard material that might damage the pipe or coating material, the trenches shall be excavated slightly deeper than required and then filled to grade with sand or fine earth.

Coated pipe shall be handled in a manner to prevent abrasion of the coating during transportation, placement, and backfilling. Pipe shall not be dropped from cars or trucks or allowed to roll down skids without proper restraining ropes. Each section of pipe shall be delivered in the field as near as practicable to the place where it is to be installed. When stockpiled, it shall be neatly piled and blocked with strips between tiers. If the pipe must be moved longitudinally along the trench, care shall be taken to insure that the pipe and the coating are not damaged. Pipe shall not be rolled or dragged on the ground. If the pipe is supported, as for welding, supports shall be of sufficient width and number and be

padded, if necessary, to prevent damage to the coating.

Aboveground Pipelines

Concrete, timber or other pipe supports, and anchor and thrust blocks shall be constructed at the locations to the dimensions shown on the drawings and/or as staked in the field. Saddles shall be shaped to firmly support the pipe throughout the full arc of contact. At least two layers of felt strips shall be placed between the pipe and its support. The felt shall cover the entire area of contact between the pipe and the saddle. A graphite lubricant shall be placed between the felt strips before the pipe is placed in the saddle.

Onground Pipelines

Pipe shall be laid to the lines and grades shown on the drawings and/or as staked in the field and shall be placed so that it is protected from the hazards imposed by traffic crossings, farm operations, or other hazards. The ground shall be shaped so as to provide support needed. If there are rocks or objects that might damage the pipe coating, sand or soil shall be used as a base for the pipe.

Concrete, timber, or other anchors and thrust blocks shall be constructed at the locations to the dimensions shown on the drawings or as staked in the field, or both.

5. JOINTS AND CONNECTIONS

Pipe joints shall conform to the details shown on the drawings and shall be sound and watertight at the pressures specified in the special provisions or maximum operating pressure if not specified.

Welding and welded joints shall conform to the welding procedure details and the requirements for repair of welds of AWWA Standard C206 for Field Welding of Steel Water Pipe (AWS D10.9). Field welding shall be done in such a way as to avoid burning the protective coating on the pipe except in the immediate vicinity of the weld.

Where welded field joints are used, they shall be single welded butt joints or lap welded slip joints, as shown on the drawings.

Where bell and spigot type joints are used, a protective coating shall be shop applied to the bell end. The bell edge of the pipe (thickness) and the pipe interior for a distance of 6 inches shall be coated in accordance with procedures detailed in the pipe specification.

The ends of pipe to be connected with mechanical couplings shall be machined so as to allow coupling the pipe sections without damaging or displacing the gaskets and to insure uniform end separation of the pipes. Machined ends of the pipe that receive the coupling sleeves shall be free from dents, gouges, rust, scale, or protective coating (except coal tar-epoxy paint). The pipe and couplings shall be assembled with continuous rubber ring gaskets conforming to the dimensions and tolerances recommended by the pipe manufacturer. Coupling followers shall be drawn up evenly to insure uniform pressure on the gaskets. The rubber gaskets shall meet the requirements specified in AWWA Standard C200.

All steel ring flanges shall be fabricated in accordance with AWWA Standard C207.

Compression couplings, valves, bolted connections and other flanged fittings shall be coated in accordance with AWWA Standard C209. Plain (ungalvanized) bolts shall be furnished regardless of coating.

Buried Pipelines

Unless otherwise specified, high-resistance joints between pipe lengths shall be electrically bridged with a welded, brazed, or soldered copper wire not smaller than 4/0 gage in size. If coated pipe is field welded, special care shall be taken to avoid burning the protective coating. After the joints are welded, they shall be covered with coating equal in quality to that specified for the pipe. Dielectric connections shall be placed as specified and detailed on the drawings.

6. FIELD COATING, WRAPPING AND REPAIR FOR BURIED PIPELINES

All field wrapping and repairs shall be as specified in AWWA Standard C209. Type I or Type II tape shall be used.

All pipe joints shall be field wrapped or coated.

After fabrication, all bolts furnished for couplings, valves, and all other types of bolted connections shall be coated.

All damaged coatings on pipe, couplings and fittings shall be field repaired.

Surface Preparation

Bare steel shall be prepared as specified in AWWA Standard C209. On previously coated surfaces all dirt, paper and other foreign matter, and loose coating, shall be removed. Welds shall be cleaned of all

welding slag, splatter, and scale. Sharp edges or burrs that could puncture or cut the coating shall be removed by grinding or filing. All welds shall be allowed to cool before applying primer or coatings. Kraft paper, whitewash, or other surface protective layers shall be removed at least 12 inches on either side of bare steel to be coated.

When bell and spigot type "O" ring joints or welded joints are used, a 2 inch wide piece of hot applied tape, or filler tape compatible with the tape system being used, shall be placed over the welded area or the sealing compound which fills the outside annular joint spaces of the rubber ring bell joint prior to applying the tape.

Repair and Patching Factory Coatings

All loose or disbonded material shall be removed from the area of the "holiday." All points, burrs, or rough edges shall be smoothed to a feathered edge. The surface shall be cleaned and prepared as specified for joints, couplings, and fittings. The exposed area shall be repaired as specified in the pipe specification. The area to be cleaned and prepared shall be at least twice the size of the "holiday." The repair coating shall be worked onto the surface of the steel so as to leave no voids or wrinkles on the surface.

All damaged vinyl coat areas shall be cleaned and recoated in accordance with the manufacturer's recommendation.

Protection

If backfilling around field coating is to be delayed more than 24 hours after application, a whitewash or alternate protective layer, as approved by the Engineer, shall be applied.

No backfilling shall be placed against a mastic coated surface until 24 hours after the mastic is applied.

7. HANDLING THE PIPE

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coating. Coated pipe shall be handled in the manner specified in the pipe specification.

8. CATHODIC PROTECTION

If specified in the special provisions, buried steel pipelines shall be protected with sacrificial galvanic anodes to supplement the protection provided by the pipe coating. The anodes shall be of the kind and number specified for the job or as shown on the drawings, or both. Anode materials shall be as specified under "Materials."

Anodes shall be placed as shown on the drawings. If horizontally placed, anodes shall be at or below the bottom elevation of the pipeline. Vertically placed anodes shall have a minimum distance of 3 feet between the ground surface and the top of the anode. Anodes shall not be placed in fill areas, and magnesium anodes must be placed a minimum distance of 10 feet from the pipeline.

Anodes shall be bedded in moist fine clay, clay loam, silt, or silt loam. In sandy and gravelly areas, fine material must be imported for bedding and for covering the anodes to a depth of 6 inches. The packaged anodes and the fine textured soil used for bedding and backfill shall be thoroughly wetted.

The lead wire from the anode, or the header wire for multiple anode installations, shall be attached to the pipeline by cadwelding, thermowelding or other similar processes. The area of damaged pipe coating and the weld shall then be covered with a coating equal in quality to that of the specified original pipe coating.

Testing station facilities shall be located and installed as specified for the job or as shown on the drawings, or both. Wires at testing stations shall be attached to the pipe by one of the processes specified for anode lead wires.

9. TESTING

Underground steel pipelines shall be tested before placing the backfill over the field joints. Aboveground steel pipelines may be tested at any time after they are ready for operation.

The pipeline shall be filled with water, taking care to bleed air and prevent waterhammer. When the line is full, all valves shall be closed, and the line shall be brought up to full design working pressure. All joints shall then be carefully inspected for leakage, and any visible leaks shall be repaired.

It shall be demonstrated by testing that all valves, vents, surge chambers, and other appurtenances function properly when the pipeline is operated at design capacity. Objectionable surge, waterhammer, unsteady delivery of water, damage to the pipeline, and detrimental discharge from control valves are evidence of malfunction.

10. BACKFILL, UNDERGROUND PIPELINES

Initial Backfill

Initial backfill shall extend a minimum of 12 inches above the top of pipe.

Initial backfill material shall be placed so that the pipe will not be displaced, excessively deformed, or damaged.

Hand, mechanical or water packing may be used.

Initial backfill material shall be soil or sand that is free from rocks or stones larger than one inch in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used.

If backfilling is done by hand or mechanical means, the initial fill shall be placed firmly around and above the pipe so there are no pockets or voids.

If the water packing method is used, the pipeline first shall be filled with water. The initial backfill before wetting shall be of sufficient depth to insure complete coverage of the pipe after consolidation. Water packing is accomplished by adding water to diked reaches of the trench in sufficient quantity to thoroughly saturate the initial backfill without excessive pooling of water. After the backfill is saturated, the pipeline shall remain full until after the final backfill is made. The wetted fill shall be allowed to dry until firm before beginning the final backfill.

Final Backfill

The final backfill material shall be free of large rocks, frozen clods, and other debris greater than three inches in diameter. The material shall be placed and spread in approximately uniform layers so that there will be no unfilled spaces in the backfill. The backfill will be to the level of the natural ground or to the design grade required to provide the minimum depth of cover after settlement.

11. MEASUREMENT AND PAYMENT

(Used only if applicable)

For items of work for which specific unit prices are established, each item will be measured to the nearest unit applicable. Payment for each item will be made at the agreed-to unit price for that item. For items of work for which specific lump sum prices are established, payment will be made at the lump sum price.

Such payment will constitute full compensation for all materials, labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work shown on the drawings or described in the special provisions but not listed on the bid schedule will be considered incidental to and included in the pay items listed on the bid schedule.