

NATURAL RESOURCES CONSERVATION SERVICE
Wyoming
CONSTRUCTION SPECIFICATIONS
FOR
IRRIGATION PIPELINE
STEEL PIPE

(Owner/Operator)

(Project/Title)

GENERAL

This specification covers the installation and materials steel pipe. Pipelines shall be installed in accordance with a design and plan approved by the responsible technician. Details of construction shown in the design and plan but not included here shall be considered as a part of this specification. Construction activities shall be in accordance with applicable OSHA regulations.

INSTALLATION

Pipe shall be the diameter, length, thickness and be coated as specified on the drawings.

The pipe shall not be handled in a manner to cause damage to the pipe and its coating. The pipe shall not be rolled or dragged on the ground. The pipe shall be lowered into the trench or onto the above ground supports by the use of canvas slings or padded cables. Individual joints of pipe shall be inspected and any damaged pipe, including coating(s) shall be removed and repaired or replaced.

Vertical alignment of pipe shall be uniform and such as to maintain the cover requirements unless otherwise noted on the drawings. If irregular grades are required, thrust blocks, air releases, drains and other appurtenances as needed shall be installed.

All joints and connections shall be constructed to withstand the design working pressure for the pipeline without leakage and shall leave the inside of the pipeline free of any obstruction which could reduce the pipe capacity below design requirements.

Surfaces of the pipe joints shall be cleaned before making joint connections.

All fittings, such as couplers, reducers, bends, tees, risers and endives and all valves and other appurtenances shall be made of material(s) that is recommended for use with the pipe and shall have coatings equal too or exceeding that specified for the pipe and shall be installed in accordance with the recommendations of the manufacturer.

The pipeline appurtenances shall be of the type, size, material and pressure class as shown on the drawings. Unless otherwise shown on the drawings all Butterfly valves shall be equipped with geared operators.

Air and vacuum relief valves and/or combination air and vacuum relief valves shall be installed at locations shown on the drawings.

Pressure relief valves shall be stamped with the pressure at which the valve starts to open. Adjustable valves shall be sealed or otherwise altered to insure that the setting marked on the valve is not changed.

Check valves shall be rated as quick-closing, non-slamming.

Drain valves shall be installed at low points in the pipeline unless provisions are made for pumping out the pipeline.

Risers shall be of the diameter and spaced as specified on the drawings. Steel risers shall have a coating with no less than a Class B rating.

The coatings on all valves and appurtenances shall be rated no less than the Class of the pipeline coating specified. All valves shall be installed in accordance with special Manufacturer recommendations.

SURFACE INSTALLATIONS

Pipe shall be supported a minimum of one foot above the ground by supports/saddles as shown on the drawings. Two layers of felt strips shall be placed between the pipe and the support. A graphite lubricant shall be placed between the pipe and the felt strip. Treated wood shall be used for timber supports.

Above ground welded joint pipelines shall have expansion couplers installed at a spacing not to exceed 400 feet. The maximum distance between a coupler and a fixed or anchored location shall be 200 feet. Couplers shall provide for a minimum of 4 inches of travel distance.

BURIED INSTALLATIONS

Trench Construction. Trench width at any point below the top of the pipe should be only wide enough to permit the pipe to be easily placed and joined and to allow the initial backfill material to be uniformly placed under the haunches and sides of the pipe. The minimum trench width shall be not less than two pipe diameters, unless the trench is precision excavated with a semicircular bottom that closely fits the pipe. Trench banks that are more than 5 feet high shall be shored or sloped. Refer to Figure 1 for typical trench details.

Power transmission lines shall not be placed in the same trench as the pipe.

Where rock, hardpan, cobbles or other hard material which might prevent the pipe from being uniformly supported is encountered in the bottom of the trench, the trench shall be undercut a minimum of four inches below final grade. The over cut area of the trench will then be filled with sand or fine-grained soil.

Bedding. The pipe shall be firmly and uniformly bedded throughout its entire length. Bedding material shall be placed and spread in uniform layers and in such a manner as to fill the trench so there are no unfilled spaces below the pipe. For pipe with bell joints, holes shall be dug in the bedding at the bells to permit the body of the pipe to be in contact with the bedding along its entire length. Blocking or mounding shall not be used to bring the pipe up to final grade.

Initial Backfill. The initial backfill material shall be soil or sand that is free from rocks, gravels, frozen materials larger than 1 inch or earth clods greater than 2 inch in diameter. This may be the on site trench excavated materials as long as any unsuitable materials are removed. The initial backfill materials shall be placed in a manner as not to displace, deform or damage the pipe.

Hand, mechanical or water packing are optional methods for placing and compacting pipe backfill.

When backfilling is done by hand or mechanical means the initial fill shall be compacted firmly around and above the pipe to achieve a soil density equal or greater than the density of the undisturbed side walls of the trench. The thickness of individual lifts prior to compaction shall not exceed 6 inches.

When water packing is used, the pipe shall be filled with water. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pipe with backfill after consolidation has taken place. Water packing shall be accomplished by adding water to diked reaches of the trench in such quantity as to thoroughly saturate the initial backfill. After the backfill is saturated, the fill shall be consolidated by rodding or with a vibrator. The wetted fill shall be allowed to dry before until firm before completing the final backfill.

Final Backfill. The final backfill material shall be free of rocks, frozen clods or other debris larger than 6 inch in diameter. The material shall be placed and spread in approximately uniform layers so there are no

unfilled spaces in the backfill. Rolling equipment shall not be used until a minimum of 18 inches of compacted backfill material has been placed over the top of the pipe. Final backfill may be mounded over the top of the trench above ground level, but in no case shall the final backfill be lower than the natural ground along the top of the trench.

All special backfilling requirements of the pipe manufacturer shall be followed.

Expansion Couplers. Below ground welded joint pipelines shall have expansion couplers installed at a spacing not to exceed 600 feet. The maximum distance between a coupler and a fixed or anchored location, such as a tee, bend or riser shall be 300 feet. Expansion couplers are not required within reaches of pipe with risers. Expansion couplers shall provide for a minimum of 4 inches of travel distance.

Joints and Connections. High resistance joints between pipe lengths shall be electrically bridged with a welded, brazed or soldered copper wire not smaller than 4/0 gauge in size. When coated pipe is welded, care shall be taken to avoid burning the coating. After the joints are welded they shall be covered with a coating equal in quality to that specified for the pipe.

Diaelectric couplers shall be placed between the following locations:

- Pump(s) and pipeline
- Pipe reaches with different coatings
- Pipe of different ages

Flanges with gaskets and bolt insulation, short sections of PVC pipe or other positive means of insulation are acceptable.

Cover. The minimum depth for backfill over the top of the pipe shall be as shown in the drawings.

At low places on the ground surface or at locations where it is shallow to rock, extra fill may be placed over the pipeline to provide the minimum depth of cover. In such cases, the top width of the fill shall be no less than 10 feet and the side slopes no steeper than 6 horizontal to 1 vertical.

COATINGS

All buried pipe shall have an outside coating of at least Class B as specified on the drawings or listed in the ADDITIONAL SPECIFICATIONS. When Class A coatings are required per the drawings refer to the ADDITIONAL SPECIFICATIONS for the coating requirements.

The following types of coatings may be used when Class B coatings are specified:

Coal-Tar-Enamel coatings meeting the requirements of AWWA C203, "Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied".

Epoxy coatings meeting the requirements of AWWA C210, "Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines" or AWWA C213, "Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel water Pipelines". The coating shall have a minimum thickness of 16 mils.

Prefabricated tape meeting the requirements of AWWA Standard C209 "Cold Applied Tape Coatings for the Exterior of Special Section, Connections, and Fittings for Steel Water Lines". Ape coatings shall have a minimum thickness of 20 mils.

Tape coatings meeting the requirements of AWWA C214, "Tape Coating Systems for the Exterior of Steel Water Pipelines".

Fittings made of steel or other materials susceptible to corrosion shall (1) be wrapped with plastic tape meeting the requirements of AWWA C 209 for Type I or II tape, or (2) coated with coal-tar epoxy paint (Kippers-Bitumastic No. 300-M is an approved off the shelf product), or (3) coated with epoxy paint in accordance with the Steel Structures Council (SSPC) Paint Specification # 16.

Steel pipe installed above ground shall be painted with one coat of urethane primer applied at a rate of 2 to 3 mils thick and two or more coats of gloss or semi-gloss Alkyd Enamel to provide a minimum thickness of 6 mils.

When an interior pipe coating is specified, the coating shall meet the following requirements:

Coal-Tar-Enamel meeting the requirements of AWWA C203, "Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied".

Cement mortar lining applied in accordance with ASTM C205, "Cement-Mortar Protective Lining and Coating for Steel Water Pipe-4 in. (100mm) and Larger-Shop Applied".

Epoxy coatings meeting the requirements of AWWA C210, "Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines" or AWWA C213, "Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel water Pipelines".

CATHODIC PROTECTION

When specified buried pipelines shall be protected with sacrificial galvanic anodes as needed to supplement the protection of the specific pipe coating. The anodes shall be of the kind and number as shown on the drawings.

Anodes shall be commercially packaged of magnesium or zinc. Zinc anodes shall meet the requirements of ASTM B418. Anodes 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 wire gauge must be sufficient to carry the design current with n more than a 20 millivolt I-R drop.

The package mix for the anodes shall be proportioned by weight as follows:

Zinc – 20 to 30% bentonite

70 to 80% gypsum

Magnesium – 20 to 25% bentonite

70 to 80 % gypsum

5 % sodium

Anodes may be placed either horizontally or vertically. When placed horizontally, they shall be at or below the bottom elevation of the pipeline. Vertically placed anodes shall have a minimum distance of three feet between the ground and the top of the anode.

Anodes shall not be placed in fill areas and magnesium anodes shall be placed no closer than ten feet from the pipeline.

Anodes shall be bedded and covered with a minimum 6-inch thickness of moist fine clay, clay loam, silt or silt loam soils materials. The packaged anodes and the soil bedding and covering shall be thoroughly wetted.

The lead wire from the anode or header wire shall be attached to the pipeline by CAD welding, thermowelding, or other process of equal result. The weld area shall be covered with a coating equal in quality to the pipe coating.

Testing stations shall be located and installed as specified on the drawings. Wires attached to the pipe shall as specified fir the anode or header wires.

VALVES AND APPURTENANCES

The pipeline valves and appurtenances shall be of the size, type, material and pressure rating as shown on the drawings. Unless otherwise shown on the drawings all Butterfly valves shall be equipped with geared operators.

Air and vacuum relief valves and/or combination air and vacuum relief valves shall be installed at locations shown on the drawings.

Pressure relief valves shall be stamped with the pressure at which the valve starts to open. Adjustable valves shall be sealed or otherwise altered to insure that the setting marked on the valve is not changed.

Check valves shall be rated as quick-closing, non-slamming.

Thrust blocks shall be formed against a solid trench wall. They shall be of the minimum size and materials as specified on the drawings.

MATERIALS

Pipe shall equal or exceed the requirements of the applicable specification for the kind of pipe and the type, weight, grade and finish specified:

American Water Works Association (AWWA) C-200 "Steel Water Pipe - 6 in. (150mm) and Larger"

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)"

Fittings shall conform to the requirements for the types and kinds specified.

ASTM A 858 "Heat-Treated Carbon Steel Fittings for Low-Temperature and Corrosive Service"

ASTM A 865 "Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints"

The minimum pipe wall thickness shall be as follows:

- < 3 inch nominal diameter Schedule 40
- 3 through 4 inch nominal diameter 0.0747 inch less 12.5%
- 4 through 18 inch nominal diameter 0.1046 inch (12 Gauge) less 12.5%
- 20 through 24 inch nominal diameter 0.1345 inch (10 Gauge) less 12.5%
- 26 through 36 inch nominal diameter 3/16 inch less 12.5%
- 38 through 48 inch nominal diameter 1/4 inch less 12.5%

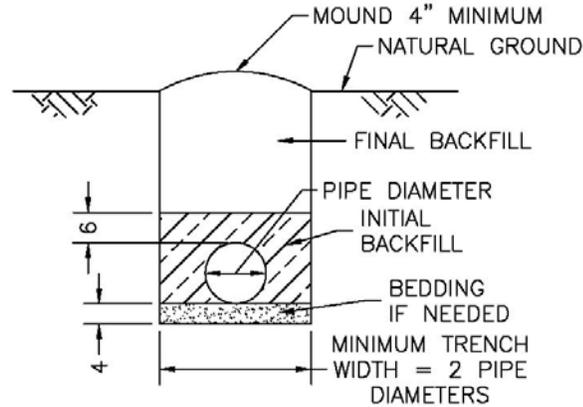
TESTING

When water is available at the time the pipe is being installed the system shall be given an operational test. This test shall consist of filling the pipe with water, taking care to bleed of any air in the pipe. All of the system components shall operate without difficulty. Leakage or defects caused by poor materials or workmanship shall be replaced or repaired. When water is not available to complete a test, the installer shall provide a guarantee stating size, type, material and pressure rating as shown on the drawings.

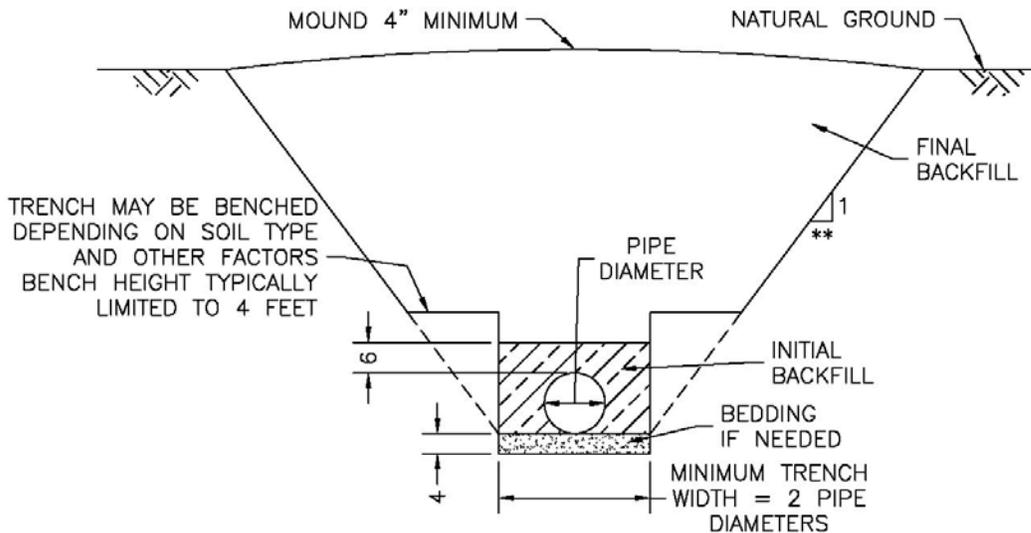
TESTING

When water is available at the time the pipe is installed the system shall be given an operational test. This test shall consist of filling the pipe with water, taking care to bleed off any air in the pipe. All of the system components shall operate without difficulty. The pressure shall be slowly brought up to the maximum working pressure for the pipeline. Leakage or defects caused by poor materials or workmanship shall be replaced or repaired. When water is not available to complete a test, the installer shall provide a guarantee stating they will return and fix leaks that are found when the pipe is initially filled with water.

**FIGURE 1
TRENCH WIDTH AND BACKFILL REQUIREMENTS**



**TYPICAL TRENCH DETAIL
5 FEET DEPTH, MAXIMUM**



**ALTERNATIVE TRENCH DETAIL
DEPTH GREATER THAN 5 FEET**

** Slope typically varies from $\frac{3}{4}$ to $1\frac{1}{2}$:1 or greater based upon material classification and other factors such as wetness, vibration, surcharge, etc. Refer to OSHA 1926 Subpart P for details.