

Corrugated Metal Pipe

1. SCOPE

The work shall consist of furnishing and placing circular, arched, or elliptical corrugated metal pipe and necessary fittings.

2. MATERIALS

Pipe and Fittings

Seams of pipe shall be welded or sealed. Helical pipe shall have annular ends.

Pipe and fittings shall conform to the requirements of the following specifications:

ASTM B 745/B 745M Corrugated Aluminum Pipe for Sewers and Drains

ASTM A 760/A 760M Corrugated Steel Pipe, Metallic Coated for Sewers and Drains

ASTM A 762/A 762M Corrugated Steel Pipe, Polymer Pre-coated for Sewers and Drains

Unless otherwise specified in the Special Provisions, perforated pipe shall conform to the requirements for Class I perforations as described in ASTM A 760 or A 762.

Coating After Fabrication

Coatings applied to corrugated steel pipe after fabrication shall conform to the requirements of:

ASTM A 849 Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe.

Riveting

When close riveted pipe is specified:

1. The pipe shall be fabricated so that the rivet spacing in the circumferential

seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe.

2. Portions of the longitudinal seams that will be covered by the coupling bands rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.

Double riveting or double spot welding for pipe less than 42 inches in diameter may be required. When double riveting or double spot welding is specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

Appurtenances

Standard fittings shall be used for the pipe. Elbows, tees, crosses, reducers, gate valves, check valves, air-and-vacuum-release valves, and pressure-relief valves 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."

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 IR drop.

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

Zinc--20 to 30 percent bentonite: 70 to 80 percent gypsum

Magnesium--20 to 25 percent bentonite: 70 to 75 percent gypsum: 5 percent sodium sulfate.

Connection Bands

Bands or couplers shall either meet the Federal, ASTM, or AASHTO Specifications detailed under "Pipe" except no flange (channel), smooth slab, or dimpled band shall be used. The selected band must provide a watertight joint.

Gaskets

Gaskets shall meet the requirements of ASTM C 443, "Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets."

3. INSTALLATION

Handling the Pipe

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in such a manner as to prevent bruising, scaling, or breaking of the zinc or bituminous coating.

Laying and Bedding the Pipe

Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. The pipe shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical mid-height of the pipe. Field welding of corrugated galvanized iron or steel pipe will not be permitted. Unless otherwise specified, the pipe sections shall
USDA-NRCS-Montana

be joined with standard coupling bands. The pipe shall be firmly and uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about a vertical center line. Perforations shall be clear of any obstructions at the time the pipe is laid.

The pipe shall be loaded sufficiently during backfilling around the sides to prevent it from being lifted from the bedding.

Strutting

When required, struts or horizontal ties shall be installed in the manner specified on the drawings. Struts and ties shall remain in place until the backfill has been placed to a height of 5 feet above the top of the pipe, or has been completed if the finished height is less than 5 feet above the top of the pipe, at which time they shall be removed by the Contractor.

Repair of Damaged Coatings

Any damage to the zinc coating shall be repaired by thoroughly wire brushing the damaged area, removing all loose and cracked coating, removing all dirt and greasy material with solvent, and painting with two coats of one of the following paint options, based upon installed exposure:

Normal exterior or interior atmospheric exposure:

Zinc dust--zinc oxide primer, ASTM D 79 and D 520, or;

Single package, moisture cured urethane primer in silver metallic color, or;

Zinc-rich cold galvanizing compound, brush, or aerosol application.

Submergence in water exposure:

Zinc dust-zinc oxide primer, ASTM D 79 and D 520, or;

Zinc dust paint, ASTM D 4146.

Whenever individual breaks exceed 36 square inches in area or when the total area of breaks exceed 0.5 percent of the total surface area of the individual pipe section, that section of pipe will be rejected.

Breaks or scuffs in bituminous coatings that are less than 36 square inches in area shall be repaired by the application of two coats of hot asphaltic paint or a coating of cold-applied bituminous mastic. The repair coating shall be at least 0.05 inches thick after hardening and shall bond securely and permanently to the pipe. The material shall meet the physical requirements for bituminous coatings contained in ASTM A 849 and A 885.

Bituminous coating damaged by welding of coated pipe or pipe fittings shall be repaired as specified in this section for breaks and scuffs in bituminous coatings.

Breaks or scuffs in polymer coatings that are less than 36 square inches in area shall be repaired by the application of a polymer material similar to and compatible with the durability, adhesion, and appearance of the original polymer coating as described in ASTM A 849, paragraph 6.8. The repair coating shall be a minimum thickness of 0.01 inch (10 mils) after drying.

Buried Pipelines

Pipe shall be laid to the lines and grades as shown on the drawings and/or as staked in the field.

The trench bottom shall be uniformly excavated so that the full length of pipe contacts the bottom without bridging. Clods,

rocks, and uneven spots that can cause non-uniform support shall be removed.

If trenches are excavated in soils containing rock or other hard material that might damage the pipe or coating material, the trenches shall be over-excavated a minimum of 4 inches and then backfilled to grade with consolidated sand or fine earth bedding.

The trench at any point below the top of the pipe shall 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 along the sides of the pipe.

Coated pipe shall be handled in a manner to prevent abrasion of the coating during transportation, placement, and backfilling. Pipe shall not be dropped or allowed to roll down skids without proper restraining ropes. If the pipe must be moved longitudinally along the trench, care shall be taken to assure that the pipe and the coating are not damaged. Pipe shall not be rolled or dragged on the ground. If the pipe is supported, the supports shall be of sufficient width and number and be padded if necessary to prevent damage to the coating.

Damaged coating shall be repaired before backfilling.

Hand, mechanical, or water packing methods shall be used where there is a potential for live loading. The initial backfill material shall be Class I, II, III, or IV as described in Figure 1. Initial backfill material, as shown in Figure 2, shall be placed from the bottom of the trench to a depth of 0.7 of the pipe diameter for circular pipe. For arched pipe, the initial fill depth shall be as given in Table 1.

Figure 1. Backfill Classification

Class of Initial Backfill Material	Description
I	Angular, 1- to 1/4-inch size, graded crushed stone with a maximum of 10 percent non-cohesive fines.
II	Coarse sands (>0.5 mm) and gravels with maximum particle size of 1 inch, including sands and gravels containing a maximum of 12 percent non-cohesive fines. Soil types GW, GP, SW, and SP are included in this class.
III	Fine sand and clayey gravels, including fine sands, sand/clay mixtures, and gravel/clay mixtures. Soil types GM, GC, SM, and SC are included in this class.
IV	Silt, silty clays, and clays, including inorganic clays and silts of medium plasticity and liquid limit. Soil types ML and CL are included in this class.

Table 1. Depth of Initial Backfill for Arched Pipe

Steel Pipe Span (in.)	Aluminum Pipe Span (in.)	Corrugations	
		2-2/3" x 1/2" (ft.)	3" x 1" (ft.)
18	17	0.4	---
22	21	0.4	---
25	24	0.4	---
29	28	0.5	---
36	35	0.5	---
43	42	0.6	0.8
50	49	0.7	0.9
58	57	0.8	1.0

Initial backfill material shall be free from rocks and hard earth clods larger than 3 inches in diameter. It shall not contain frozen material, sod, cinders, or earth containing a high percentage of organic material.

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

If backfilling is done by hand or mechanical means, initial fill shall be compacted firmly in 4- to 6-inch lifts around the pipe, as required in Figure 2 or Table 1, to provide

USDA-NRCS-Montana

adequate lateral support to the pipe. Each lift shall be shoveled and tamped between the pipe and the side of the trench to provide satisfactory pipe support. Care shall be taken to assure that backfill is placed under the haunches of the pipe sufficiently to fill all voids and provide uniform bearing.

The GC and SC of Class III and all Class IV initial backfill material shall be compacted to a density equal to or greater than the surrounding soil material.

If the water packing method is used, the pipeline shall first be filled with water. The initial backfill, before wetting, shall be of sufficient depth to ensure a final depth of 0.7 of the pipe diameter for circular pipe or the depth required in Table 1 for arched pipe

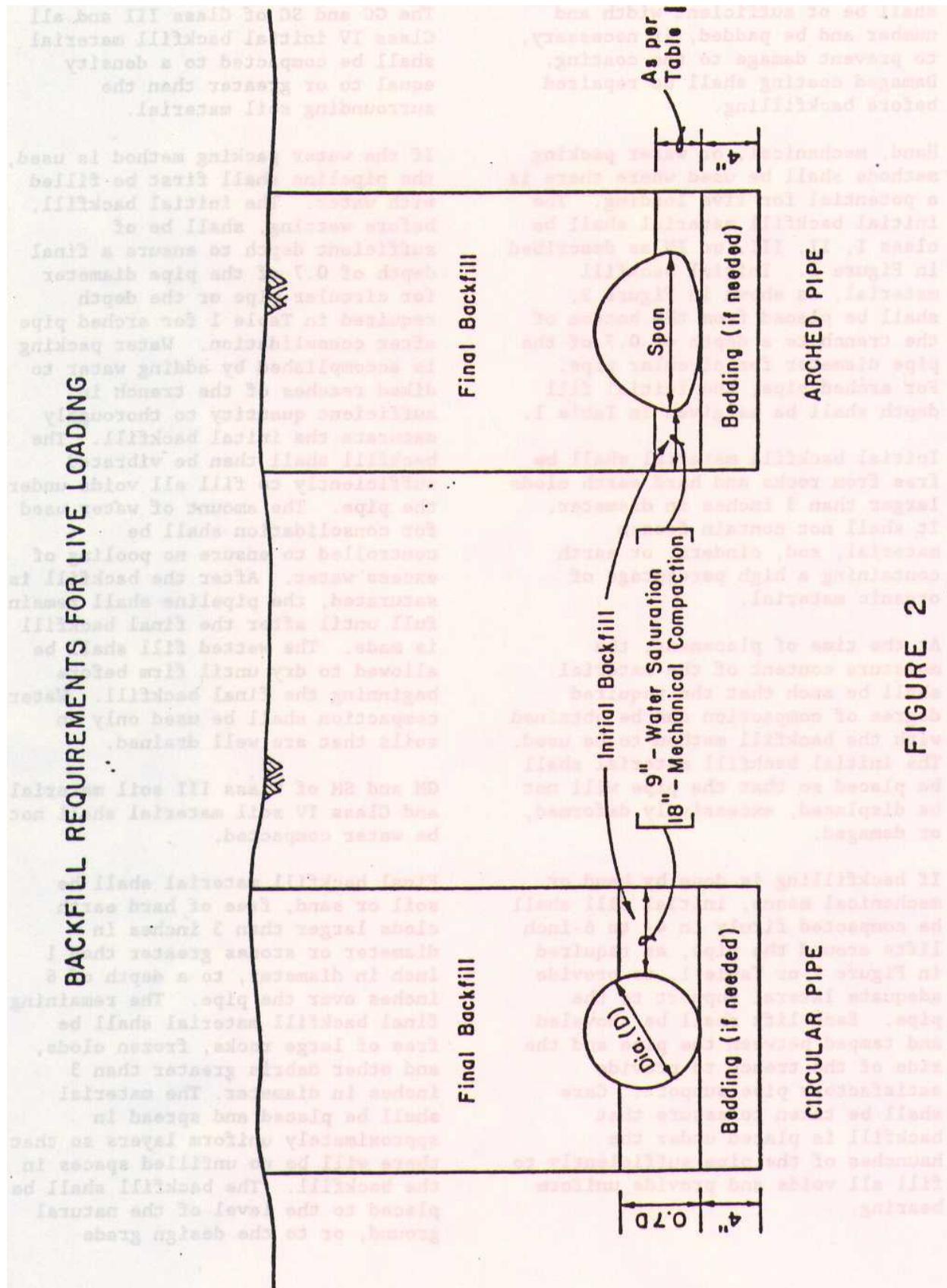


FIGURE 2

after consolidation. Water packing is accomplished by adding water to diked reaches of the trench in sufficient quantity to thoroughly saturate the initial backfill. The backfill shall then be vibrated sufficiently to fill all voids under the pipe. The amount of water used for consolidation shall be controlled to ensure no pooling of excess 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. Water compaction shall be used only on soils that are well drained.

GM and SM of Class III soil material and Class IV soil material shall not be water compacted.

Final backfill material shall be soil or sand, free of hard earth clods larger than 3 inches in diameter or stones greater than 1 inch in diameter, to a depth of 6 inches over the pipe. The remaining final backfill material shall be free of large rocks, frozen clods, and other debris greater than 3 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 shall be placed to the level of the natural ground, or to the design grade required to provide the minimum depth of cover after settlement.

Rolling equipment shall not be used to consolidate the final backfill until the specified minimum depth of cover has been placed.

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

In the situations where there is no potential for live loading, "initial backfill" criteria shall apply only to backfilling under the haunches of the pipe. Remaining backfill shall be according to "final backfill" criteria.

Aboveground Pipelines

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

Onground Pipelines

Pipe shall be laid to the lines and grades shown on the drawings and/or as staked in the field. The ground shall be shaped so as to provide support.

If there are rocks or objects that might damage the pipe coating, sand or fine soil shall be used as a base for the pipe.

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

Joints and Connections

All joints and connections shall be capable of withstanding the design maximum working pressure for the pipeline without leakage and shall leave the inside of the line free of any obstruction that can reduce its capacity below design requirements. Gaskets shall be installed according to the recommendations of the pipe manufacturer.

All fittings, such as couplings, reducers, bends, tees, and crosses, shall be installed according to the pipe manufacturer's recommendations.

Fittings and appurtenances made of unprotected steel or metals susceptible to corrosion shall be adequately protected by wrapping them with plastic tape or applying a coating having high corrosion preventing qualities. If plastic tape is used, all surfaces shall be thoroughly cleaned and coated with a primer compatible with the tape before wrapping them.

Embedment in Concrete

Special treatment shall be provided to the pipe surface when embedded or attached to concrete and the pipe material is aluminum or aluminum-coated and aluminum-zinc alloy coated. Potential contact surfaces in contact with concrete and masonry surfaces shall be coated with two coats of bituminous paint of the cutback type. Placement of the pipe shall be such that direct metal to metal contact with other material, such as embedded steel reinforcement or water control gates is prevented.

Cathodic Protection

Buried pipelines shall be protected with sacrificial galvanic anodes if they are specified 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 and shall be bedded in moist clay, clay loam, loam, silt loam, or silt. 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.

On buried pipelines where cathodic protection is required, high-resistance joints between pipe lengths shall be electrically bridged with a welded, brazed, or soldered insulated copper wire not smaller than #6 American Wire Gage (AWG). After the joints are welded, they shall be covered with a coating equal in quality to that specified for the pipe. Dielectric connections shall be placed as specified on the drawings.

Testing station facilities shall be located and installed as specified for the job, 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.

Testing

Underground pipelines shall be tested before placing the backfill over the field joints. Aboveground pipelines may be tested at any time after they are ready for operation. Any joints that are visibly leaking at design operating head shall be repaired.

It shall be demonstrated that the pipeline will function properly at and below design flow.

4. 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.