Irrigation Water Conveyance (ft)

Corrugated, Ribbed or Profile Wall Thermoplastic Pipe

Definition

A pipeline and appurtenances installed in an irrigation system.

Scope

This standard applies to corrugated, ribbed or profile wall thermoplastic pipe with vents open to the atmosphere. The pipe shall be limited to the following maximum diameters:

Pipe	Max. Dia.
Corrugated Polyethylene (PE) Tubing and Fittings (ASTM F 667)	36-in.
Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe (ASTM F 894)	120-in.
Poly(Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter (ASTM F 794)	48-in.

Purpose

To prevent erosion, loss of water quality and to reduce water conveyance losses for proper management of irrigation water.

Conditions where practice applies

All pipelines shall be planned and located to serve as integral parts of an irrigation water distribution or conveyance system designed to facilitate the conservation and management of soil and water resources on a farm or group of farms.

All areas served by the pipeline shall be suitable for use as irrigated land.

Water quality and quantity shall be sufficient to make irrigation practical for the crop to be grown and the irrigation water application methods to be used while considering the effects on downstream flows or aquifers. Consideration shall also be given to the effects of the planned pipeline on existing wetlands or water-related wildlife habitats.

TABLE 2

CONVERSION OF LIVE LOAD TO TOTAL DESIGN FILL HEIGHTS

Point Live Load (lbs)	Depth of Cover on Pipe (ft)	Live Load Equivalent Fill Height* (ft)	Total Design Fill Height (Dead + Live) (ft)
16,000 (10,000)	2.5	14-ft. (9-ft.)	16.5 (11.5)
	3.0	10-ft. (6-ft.)	13.0 (9.0)
	4.0	5-ft. (3-ft.)	9.0 (7.0)
	5.0	3-ft. (2-ft.)	8.0 (7.0)
	6.0	2-ft. (1-ft.)	8.0 (7.0)
	8.0	1-ft. (1-ft.)	9.0 (9.0)
	10.0	0-ft. (0-ft.)	10.0 (10.0)

* Assumed soil unit weight = 100 pcf.

Vents. Vents shall be designed into the systems to provide for the removal and entry of air and protection from surge. They shall:

1. Have a minimum freeboard of 1-ft above the hydraulic gradeline. The maximum height of the vent above the pipeline must not exceed the maximum allowable pressure head of the pipe.

2. Have a minimum diameter of 1/4 of the pipeline diameter.

3. Be located:

   a. At the upstream and downstream ends of the pipeline.

   b. At summits in the line.

   c. At points where there are changes in grade in a downward direction of flow of more than 10 degrees.

   d. At a maximum spacing of 1320-feet.

Drainage and flushing. Provisions shall be made for draining the pipeline to prevent freezing and/or flushing to prevent accumulation of sediment within the pipe, as necessary.

Drainage and/or flushing outlets shall be located at the low points along the line and shall be designed to minimize erosion or ponding. If drainage cannot be provided by gravity, provisions shall be made to empty the line by pumping.

Flushing outlets shall be large enough to create a velocity in the pipe which will transport the sediment accumulation.

Outlets. Appurtenances for delivering water from a pipe system to the land, to a ditch, or to a surface pipe system shall be known as outlets. Outlets shall have the capacity to deliver the required flow:

1. To a point at least 6-in. above the highest field elevation.

2. To the hydraulic gradeline of a pipe, ditch, canal or water control structure.

Joints and connections. All connections shall be designed to withstand the maximum pressure head of the pipeline without leakage or obstructions to the pipe flow area.

Materials. All materials shall meet or exceed the minimum requirements indicated in "Specifications for Materials."

Plans and specifications. Plans and specifications for corrugated, ribbed or profile wall thermoplastic irrigation pipelines shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Irrigation Water Conveyance

Corrugated, Ribbed or Profile Wall Thermoplastic Pipeline Specifications

Installation

Water Quality. Consideration shall be given to the effects of installing the pipeline on vegetation that may have been located next to the original conveyance, erosion at the construction site and the movement of sediment to water courses.

Minimum depth of cover. The pipeline shall be buried. Where there is no hazard to the pipe from traffic crossings, freezing, deep soil cracking or farm operations the minimum cover shall be 18-inches. Where cover is obtained by building fill over the pipeline the minimum top width shall be 1 1/2 times the pipe diameter and the side slopes shall be 6:1 or flatter. Traffic crossings shall have a minimum of 2.5-feet of cover.

Trench construction. The trench at any point below the top of the pipe shall be 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. The minimum trench width is shown in Figure 2.

The trench bottom shall be uniform so that the pipe lays on the bottom without bridging. Clods, rocks and uneven spots that can damage the pipe or cause nonuniform support shall be removed. If rocks, boulders or unstable material is encountered in the trench bottom, the trench shall be excavated a minimum of 4-inches below grade and filled with initial backfill material.

Provisions shall be made to assure safe working conditions if unstable soil, trench depth, or other conditions can be hazardous to personnel working in the trench. Trench banks more than 5-feet high shall be shielded, shored or sloped back to a stable slope if personnel are exposed to danger.

Pipe Placement. The pipe shall be handled in a manner to prevent damage during transportation, placement and backfilling. Pipe shall not be dropped or allowed to roll freely down skids. In hot weather, after the pipe has been assembled, it shall be allowed to cool to ground temperature before backfilling to prevent pullout of the joints. The pipe shall be uniformly and continuously supported over its entire length on firm stable material. Blocking or mounding shall not be used to bring the pipe to final grade. Where bells, fittings or connections extend below pipeline grade, holes shall be excavated in the trench bottom to allow for unobstructed assembly of the joint and to permit the body of the pipe to be in contact with the trench bottom throughout its entire length.

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 flow area free of any obstructions. Joints, fittings and appurtenances shall be installed according to manufacturer's recommendations.

Testing. Prior to backfilling at the joints, the line shall be slowly filled with water. Adequate provisions shall be made for air release during filling operations. The pressure head shall be slowly built up to the maximum design pressure head of the system and held at design pressure head for 6-hours. While this pressure head is maintained all exposed pipe fittings and appurtenances shall be examined for leaks. Any leaks shall be repaired and the pipeline retested.

It shall also be demonstrated by testing that the pipeline will function properly. At or below design capacity, there shall be no objectionable flow conditions. Objectionable flow conditions shall include water hammer, continuing unsteady delivery of water, damage to the pipeline, or detrimental discharge from control valves, or vents.

Initial Backfill. All special backfilling requirements of the pipe manufacturer shall be met. Hand or mechanical compaction methods shall be used to compact the initial backfill. The initial backfill material shall be Class I, II or III as described in Figure 1. Initial backfill material shall be placed from the bottom of the trench to at least 0.7 of the pipe diameter as shown in Figure 2. The initial backfill material shall be compacted firmly in 4-inch to 6-inch lifts around 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. At the time of placement, the moisture content of the material shall be such that compaction can be obtained. The pipeline shall be held in place, if necessary, during installation of the initial backfill.

Final backfill. The final backfill located within 9-inches of the top of the pipe shall be soil or sand free of hard earth clods or stones greater than 1 1/2-inch diameter. The remaining final backfill shall be free of rocks and clods greater than 6-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.

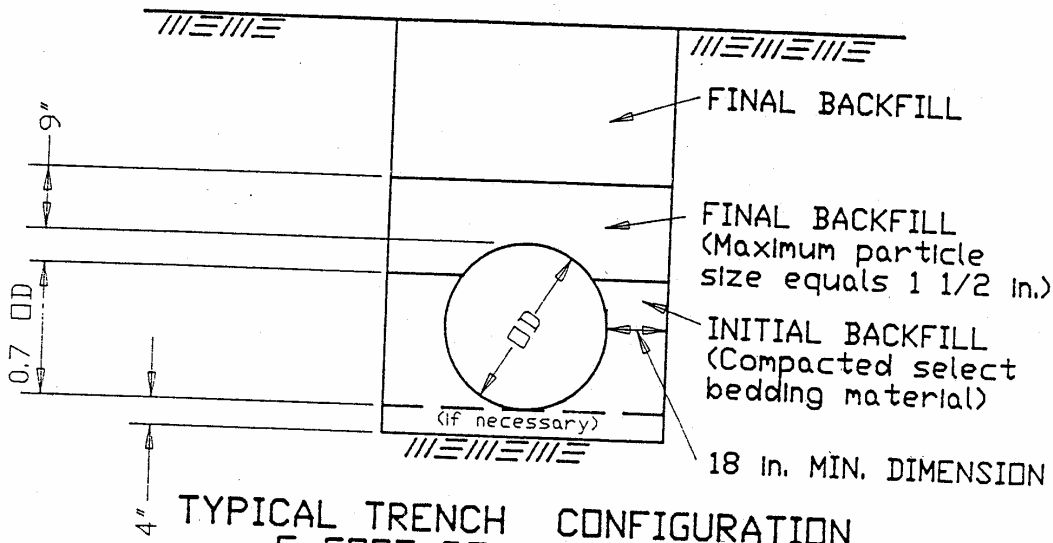
FIGURE 1

INITIAL BACKFILL MATERIAL DESCRIPTION

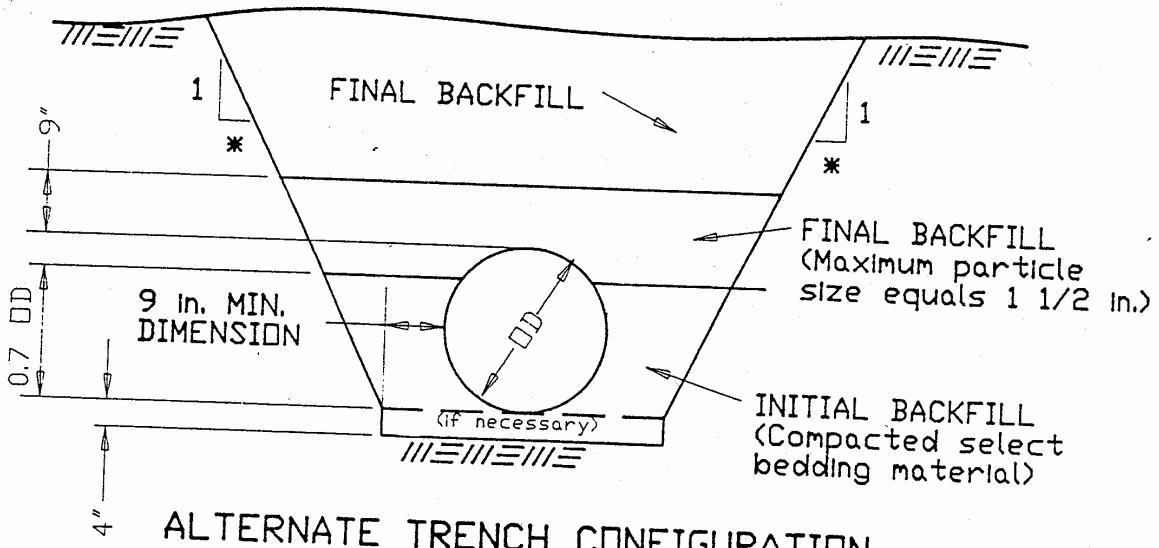
Class of Select Initial Backfill Material	Description
I	Angular 1/4 to 1 1/2-inch size, graded, crushed stone with a maximum of 10% non-cohesive fines.
II	Coarse sands (>0.5 mm) and gravels with a maximum particle size of 1 1/2-inch including sands and gravels containing a maximum of 12% non-cohesive 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.

FIGURE 2

TRENCH WIDTH AND BACKFILL REQUIREMENTS



TYPICAL TRENCH CONFIGURATION
5-FOOT DEPTH, MAXIMUM



ALTERNATE TRENCH CONFIGURATION
5 TO 20 FOOT DEPTH

* Slope varies from 3/4:1 to 1 1/2:1 or greater based on material classification and other factors such as wetness, vibration, surcharge, etc. Refer to OSHA Subpart P for details.

Basis of acceptance. The acceptability of the pipeline shall be determined by inspections to check compliance with all the provisions of this standard, including the design of the line, the pipe and pipe markings, the appurtenances, and the minimum installation requirements.

Certification and guarantee. If requested by the State Conservation Engineer, the manufacturer shall certify that the pipe meets the requirements specified in this standard.

The installing contractor shall certify that his installation complies with the requirements of this standard. He/she shall furnish a written guarantee that protects the owner against defective workmanship and materials for not less than one year and that identifies the manufacturer and markings of the pipe used.

Materials

Appurtenances. Standard fittings shall be used, if available. Elbows, tees, reducers, valves, air valves, vents, stands and joints shall be of the size and material specified and as shown on the drawings. All fittings shall equal or exceed the same pressure rating of the pipe with which they are used. Fittings and appurtenances, such as valves, and vents, that are fabricated from steel shall be coated with a manufacturer's coating suitable for burial such as coal tar epoxy paint or a tape wrap. Elbows, tees, reducers and connectors fabricated from steel shall be lined with coal tar enamel or coal tar epoxy paint and coated with coal tar enamel, coal tar epoxy paint or a tape wrap. Lining and coating material shall be installed in accordance with the manufacturer's recommendations.

Pipe. Pipe and fittings shall equal or exceed the requirements specified in one of the following specifications.

ASTM F 667, Large Diameter Corrugated Polyethylene Tubing and Fittings.

> Type C (corrugated inside and outside) and Type S (corrugated outside with smooth inner liner) polyethylene pipe and fittings shall conform to ASTM Specification F 667 except that the pipe and fittings shall be manufactured from only the high density polyethylene (HDPE) compounds which conform with the requirements of Type III; Class C; Category 3, 4 or 5; Grade P33 or P34, as described in ASTM D 1248, Polyethylene Plastics Molding and Extrusion Materials.

ASTM F 894, Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

ASTM F 794, Poly(Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.