

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE SPECIFICATION**

**IRRIGATION WATER CONVEYANCE, LOW PRESSURE  
UNDERGROUND, PLASTIC PIPELINE**

(ft)  
**CODE 430-EE**

### 1. SCOPE

The work shall consist of installing underground thermoplastic pipelines ranging from 4 to 18 inches in diameter that are subject to internal pressures up to 50 lb/in<sup>2</sup>.

### 2. MATERAILS

**a. Quality of plastic pipe.** The compound used in manufacturing low-pressure plastic irrigation pipe shall meet the requirements of one of the following materials and have an established long-term hydrostatic design stress rating as listed:

#### 1. Polyvinyl chloride (PVC) as specified in ASTM-D-1784

Material	Code classification	Designation
Type I, Grade 1	12454-B	PVC 1120
Type I, Grade 2	12454-C	PVC 1220
Type II, Grade 1	14333-D	PVC 2110
Type II, Grade 1	14333-D	PVC 2112
Type II, Grade 1	14333-D	PVC 2116

#### 2. Acrylonitrile-butadiene-styrene (ABS) as specified in ASTM-D-1788

Material	Code classification	Designation
Type I, Grade 2	5-2-2	ABS 1210
Type I, Grade 3	3-5-5	ABS 1316
Type II, Grade 1	4-4-5	ABS 2112

#### 3. Polyethylene (PE) as specified in ASTM-D-1248

Material	Code classification	Designation
Grade P23, Class C	IIC-P23	PE 2306
Grade P33, Class C	IIC-P33	PE 3306
Grade P34, Class C	IVC-P34	PE 3406

Clean rework material, generated from the manufacturer's own pipe production, may be

used by the same manufacturer if the pipe produced meets all requirements of this standard.

The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign matter, or other defects. The pipe shall be as uniform in color, opacity, density, and other physical properties as is commercially practicable.

**b. Markings.** Markings on the pipe shall include the following, which shall be spaced at intervals of not more than 5 ft:

- Nominal pipe size (e.g., 10 in.),
- Type of plastic material according to the designation code (e.g., PVC 1120),
- Maximum allowable working pressure:
  - For low-head plastic irrigation pipe (50-ft. head or 22 lb/in<sup>2</sup>),
  - For 50 psi plastic irrigation pipe (50 lb/in<sup>2</sup>),
  - For IPS pipe, the appropriate pressure rating (e.g., 63 lb/in<sup>2</sup>).
- Specification designation with which pipe complies:
  - For plastic irrigation pipe, the designation PIP,
  - For IPS-size pipe, the ASTM designation (for example, D-2241).
- Manufacturer's name (or trademark) and code.

**c. Pipe requirements.** Plastic irrigation pipe (PIP) installed under this standard shall be classified in one of the following categories:

- Low-head irrigation pipe shall meet the applicable dimensional requirements listed in **Table 3 of the standard**. The maximum working pressure for this pipe shall be 50 ft. of head or 22 lb/in<sup>2</sup>.

## Specification – 430-EE - 2

- 50-lb/in<sup>2</sup> plastic irrigation pipe shall meet the dimensional requirements listed in **Table 4 of the standard** for the appropriate PVC and ABS plastic materials. The maximum allowable working pressure for this pipe shall be 50 lb/in<sup>2</sup>.

In addition, the pipe shall meet the requirements specified in the sections of the ASTM designations listed below, except that the dimensions and tolerances in **Tables 3 and 4** of this standard shall apply.

- For PVC pipe, ASTM-D-2241 sections pertaining to dimensions and tolerances, flattening, extrusion quality, conditioning, test conditions, and sampling.
- For ABS pipe, ASTM-D-2282 sections pertaining to dimensions and tolerances, conditioning, test conditions, and sampling.
- For PE pipe, ASTM-D-2239 sections pertaining to dimensions and tolerances, bond, carbon black, density, conditioning, test conditions, and sampling.

IPS-size pipe (outside diameter same as that for iron pipe sizes) manufactured, tested, and marked according to one of the following ASTM specifications and having a pressure rating for water of at least 50 lb/in<sup>2</sup> but less than 80 lb/in<sup>2</sup> shall be acceptable under this standard. However, the maximum operating pressure for such pipe shall be 50 lb/in<sup>2</sup>.

ASTM-	Standard specification for-
D-1785	Polyvinyl chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
D-2241	Polyvinyl chloride (PVC) Plastic Pipe, (SDR-PR).
D-2672	Bell-End Polyvinyl chloride (PVC) Plastic Pipe.
D-1527	Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.
D-2104	Polyethylene (PE) Plastic Pipe, Schedule 40.
D-2447	Polyethylene (PE) Plastic Pipe, Schedules 40 and 80. Based on Outside Diameter.

**Fittings and couplers.** All fittings and couplers shall equal or exceed the same pressure rating of the pipe with which they are used. They shall be made of material that is recommended for use with the pipe.

The pipe shall be furnished with belled ends or separate couplers and fittings that are suitable for joining the pipe and appurtenances by means of, a solvent cement joint, rubber gasket-type joint, or other methods recommended by the pipe manufacturer. Belled ends, sleeves, or plastic fittings shall be made of the same type of plastic material as the pipe.

Fittings or belled ends for solvent cement joints shall have tapered sockets with socket lengths of at least 40 percent of the inside diameter of the pipe or 3 in., whichever is greater. Sleeves for clamp-type joints shall provide a minimum of 4 in. overlap between the sleeve and the pipe or fitting.

**Solvent cement joints.** Solvent for solvent cement joints shall conform to ASTM specifications D-2564 for PVC pipe and fittings and D-2235 for ABS pipe and fittings.

**Rubber gasket joints.** Rubber gasket joints shall conform to the following:

- Push-on type-A. A joint in which an elastomeric ring gasket is compressed in the annular space between a belled end or socket and spigot end of pipe.
- Mechanical joint-A. A joint in which a seal or gasket is compressed by application of pressure through a mechanical device. The pipe spigot shall have a wall thickness sufficient to withstand, without deformation or collapse, the compressive force exerted when the fitting is tightened.
- Dimensions of the coupling and spigot end shall be according to the manufacturer's standard design dimensions and tolerances. Such dimensions shall be gaged at sufficiently frequent intervals to insure dimensional control and satisfactory joint assembly. The method for measuring these dimensions shall be according to Method D-2122.
- Gasket dimensions shall be according to the manufacturer's standard design dimensions and tolerances. The size and shape of the gasket must insure an adequate compressive force against the spigot and socket after assembly to effect a positive seal under all combinations of joint and gasket tolerances when tested according to items 1 and 2 below.

- Elastomeric compounds must be non-crazing to pipe. The gasket in the cured state shall not cause craze marks, pits, or blisters when in contact with the plastic pipe. The plastic pipe can be stained in the area of gasket contact.
- Lubricant, if required, shall be suitable for lubricating the parts of the joints in the assembly. The lubricant shall have no deteriorating effects on the gasket and pipe materials.
- The joint shall be designed to provide a permanent seal.
- The gasket shall be the sole element depended upon to make the joint flexible and watertight. The gasket shall be a continuous elastomeric ring.
- The joint design may provide for the axial deflection of a pipe joint by permitting one side of the outside perimeter of the joint to open wider than the compressed position without leaking. If greater deflections than provided by the joint design are required, suitable fittings must be provided.
- The joint components shall be of such design that they will withstand the forces caused by the compression of the gasket when joined without cracking or fracturing when tested according to items 1 and 2 below.
  1. All surfaces of the joint upon or against which the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.
  2. Pipes in straight alinement. Laboratory hydrostatic pressure tests on joints shall be made on an assembly of two sections of pipe properly connected according to the joint design. After the pipe sections are fitted together with the gasket or gaskets in place, the assembly shall be subjected for the following time at the stated hydrostatic pressure:
    - 0 to  $\frac{3}{4}$  working pressure - 5 minutes
    - 1.0 working pressure – 10 minutes
    - 2-1/2 working pressure – 60 minutes.

- Pipes in maximum deflected position. Using a pipe and joint system, similar to that described in item 2 above, deflect the test sections axially to the maximum deflection specified by the manufacturer and subjected to the pressures indicated in item 2.
- Two specimens of any one size shall pass the tests. Retest of two other specimens shall be required if one of the first two fails. Three of the four shall pass the tests.

### 3. INSTALLATION

**Minimum depth of cover.** Pipe shall be installed at sufficient depth below the ground surface to provide protection from hazards imposed by traffic crossing, farming operations, freezing temperatures, or soil cracking. The minimum depth of the cover shall be 30 in., but in soils subject to deep cracking, the cover shall be a minimum of 36 in. The maximum depth of cover for all pipe sizes shall be 4 ft.

In areas where the pipe will not be susceptible to freezing and vehicular or cultivation hazards and the soils do not crack appreciably when dry, the minimum depth of cover may be reduced to 18 in. for pipes 4 in. through 6 in. in diameter and 24 in. for pipes more than 6 in. in diameter.

At low places on the ground surface, extra fill may be placed over the pipeline to provide the minimum depth of cover. The top width of the fill shall be no less than 10 ft. and the side slopes no steeper than 6 horizontal to 1 vertical. The fill material shall be placed and compacted before the trench is excavated. If extra protection is needed at vehicular crossings, encasement pipe or other approved methods may be used.

The trench bottom shall be uniform so that the pipe lies on the bottom without bridging. Clods, rocks, and uneven spots that can damage the pipe or cause nonuniform support shall be removed.

If there are rocks, boulders, or any other material that might damage the pipe, the trench bottom shall be undercut a minimum of 4 in. below final

#### **Specification – 430-EE - 4**

grade and filled with bedding material consisting of sand or compacted fin-grained soils.

Provisions shall be made to insure safe working conditions if unstable soil, trench depth, or other conditions can be hazardous to personnel working in or near the trench.

**Placement.** Care shall be taken to prevent permanent distortion and damage when handling the pipe during unusually warm or cold weather. The pipe shall be allowed to come within a few degrees of the temperature it will have after it is completely covered before placing the backfill, other than that needed for shading, or before connecting the pipe to other facilities. 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.

For pipe with belled ends, bell holes shall be excavated in the bedding material, as needed, to allow for unobstructed assembly of the joint and to permit the body of the pipe to be in contact with the bedding material throughout its 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 inside of the line free of any obstruction that can reduce its capacity below design requirements.

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

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

**Thrust blocks.** Thrust blocks must be formed against solid unexcavated earth undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and the trench wall shall be filled to the height of the outside diameter of the pipe or as specified by the manufacturer.

**Testing.** The pipeline shall be thoroughly and completely tested at the design pressure for pressure strength and leakage while uncovered or only partly backfilled. If it is necessary to partly backfill the line before testing to hold the pipeline in place, backfilling shall be according to the specifications under the **Initial Backfill** section below. All joints and connections shall be left uncovered for inspection; only the body of the pipe sections may be covered.

The pipeline shall be slowly filled with water. Adequate provision shall be made for air release during filling operations, taking care to bleed all entrapped air. The pressure shall be slowly built up to the maximum design working pressure of the system. While this pressure is maintained, all exposed pipe, fittings, valves, hydrants, joints, appurtenances, and covered parts of the line shall be examined for leaks. Any leaks shall be repaired and the system retested.

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

**Initial Backfill.** The pipeline shall be filled with water and maintained near design working pressure during backfilling

The initial backfill material shall be selected soil or sand free from rocks or stones larger than 1 in. in diameter and earth clods greater than about 2 in. in diameter. The material shall be placed so that the pipe will not be displaced, excessively deformed, or damaged. Plastic pipe under pressure is susceptible to breakage when struck.

Water packing shall be used when possible to consolidate the initial backfill around the pipe. The initial backfill, before wetting, shall be of sufficient depth to insure complete coverage of the pipe after consolidation occurs. Water packing is accomplished by adding enough water to diked reaches of the trench to saturate the initial backfill thoroughly without excessive pooling. After the initial fill is saturated, the pipeline shall remain full until after final backfilling. The waterpacked backfill shall be

allowed to dry until firm enough to walk on before final backfill is begun.

If conditions do not permit water packing, the initial backfill shall be placed in layers and compacted around and about 6 in. above the pipe by hand or mechanical methods to the soil density required to provide adequate lateral support to the pipe.

An exception to water packing or to compacting the initial backfill completely is permitted if the trench is precision excavated and has a semicircular bottom that closely fits the pipe and the width does not exceed the outside diameter of the pipe by more than 10 percent. With this type of trench construction, all other initial and final backfill requirements shall apply, including having the pipe under water pressure during backfilling.

**Final backfill.** Final backfill material shall be free of large rocks, frozen clods, and other debris greater than 3 in. in diameter. The material shall be placed and spread in approximately uniform layers so that there will be no unfilled voids in the backfill and the backfill will be level with the natural ground or at the design grade required to provide the minimum depth of cover after settlement takes place. Rolling equipment shall not be used to consolidate the final backfill.

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

**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 the standard.

The installing contractor shall certify that the installation complies with the requirements of this standard and shall furnish a written guarantee that protects the owner against defective workmanship and materials for not

less than 1 year and that identifies the manufacturer and markings of the pipe used.

#### 4. OPERATION AND MAINTENANCE PLAN

A properly operated and maintained irrigation pipeline is an asset to a farming operation. When federal funds are used to pay for this practice, it must be maintained for a period of 25 years. The estimated life span of 25 years for this installation can be assured, and usually increased, by developing and carrying out a good operation and maintenance program.

The following are some recommendations to help develop an operation and maintenance program.

- Check to make sure all valves and air vents are set at the proper operating condition so they may provide protection to the pipeline.
- Maintain the design depth of cover over the pipeline.
- Limit traffic over the pipeline to designated sections that are designed for traffic loads and avoid travel over pipelines by tillage equipment when the soil is saturated.
- Avoid any sub-soiling operation that may disturb the pipeline.
- Remove all foreign debris that hinders system operation.
- Drain the system and components in areas that are subject to freezing.
- Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.
- Allow adequate time to fill the pipeline gradually.
- Periodically check and repair all valves, gates, vents, inlets, and outlets to the pipe system to ensure proper operation.

Immediately repair any vandalism, vehicular, livestock, or other damage to any outlets and appurtenances.