

**NATURAL RESOURCES CONSERVATION SERVICE
PACIFIC ISLANDS AREA**

CONSERVATION PRACTICE SPECIFICATION

**IRRIGATION PIPELINE (430)
(PLASTIC PIPE)**

SCOPE

The work shall consist of furnishing and installing thermoplastic pipe and necessary appurtenances to the alignment, grades, and dimensions as shown on the drawings and/or staked in the field. The work also includes site preparation, earth fill, excavation, and any other applicable practice necessary for installation as shown on the drawings. This specification only applies to pipelines used as part of an irrigation system. Unless otherwise specified, the pipe shall conform to the requirements listed in this specification, NRCS-PI Irrigation Pipeline (430) Standard, and the requirements shown on the drawings.

SAFETY

Landowners or operators, sponsoring organizations, and contractors shall be liable for damage to utilities and damage resulting from disruption of service caused by construction activities. The Natural Resources Conservation Service makes no representation on the existence or non-existence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

It is the responsibility of the landowner or operator to determine if there are buried or overhead utilities in the vicinity of the proposed work. They should take proper procedures to ensure that the utilities shall not be jeopardized and that equipment operators and others will not be injured during construction operations.

MATERIALS

This section covers the quality and requirements of Polyvinyl Chloride (PVC), corrugated Polyethylene (PE), High Density Polyethylene (HDPE), and Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe, fittings, and joint materials.

Material/Polymer requirements. Pipe and fittings materials shall meet the minimum cell classification and material designation as stated in **Table 1**.

Pipe requirements. Manufactured pipe shall meet the applicable ASTM/AWWA standards listed in **Table 2**. Except for corrugated PE, all pipes shall be pressure-rated for water. ABS pipe shall be of solid wall construction.

Pipe shall be as uniform as commercially practicable in color, opaqueness, density, and other specified properties. It shall be free of visible cracks, holes, foreign inclusions, sunburn, bleaching, or other defects. The dimensions of the pipe shall be measured as prescribed in ASTM Standard D2122.

Wall thickness. The wall thickness for all pipe installed under this standard, regardless of pressure rating or type, shall not be less than 0.060 inches.

Pipe joints and fittings. All fittings shall meet or exceed the same strength, pressure, and dimension requirements as those of the pipe and shall be made of material that is recommended for use with the pipe. Joints and fittings shall meet the applicable ASTM specification and shall be used and installed according to the recommendations of the manufacturer.

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.

Fittings or belled ends for solvent cement joints shall have tapered sockets with socket lengths as per ASTM D2672. Sleeves for clamp-type joints shall provide a minimum of 4 inches overlap between the sleeve and the pipe or fitting.

Table 1 - Material Requirements

Material	Cell Class	Allowable Material Designation	Applicable Material Specification
Polyvinyl Chloride	12454	PVC1120	ASTM D1784
		PVC1220	
	14333	PVC2120	
Polyethylene	345464C or greater	PE3408 or greater	ASTM D3350 ASTM F2306 (corrugated PE)
Acrylonitrile-Butadiene-Styrene	20643 or greater	ABS1210 or greater	ASTM D3965

Table 2 - Applicable Pipe Standards

Material	PVC	PE	Corrugated PE	ABS
Applicable Specification	ASTM D1785 ASTM D2241 ASTM D2672 AWWA C900 AWWA C905	ASTM D2239 ASTM D3035 ASTM F714 ASTM F771 AWWA 906	ASTM F2306 AWWA 906	ASTM D1527

Rubber gasket joints. Rubber gasket joints shall conform to ASTM Specification D3139 for pressure pipe or D3212 for corrugated PE pipe. All rubber gaskets shall conform to ASTM F477. Gasket lubricant shall be suitable for use in water transmission applications. The gasket shall be the sole element depended upon to make the joint flexible and water tight. 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 integrity of the joint.

Markings. Fitting markings shall include, as a minimum, the following information:

- Manufacturer's name or trademark
- Nominal size
- Pipe Schedule/pressure class/rating for water at 73 degrees F
- Materials name and designation (PVC1120, PE3408, etc)
- Recognized standard to which fitting is designed and manufactured

Pipe markings shall be repeated at a minimum interval of 5 ft along the pipe and shall include, in addition to fitting marking requirements, the following information:

- Specific production code including month and year
- Outside diameter base/system (IPS, PIP, etc)

INSTALLATION

Construction activities shall follow all OSHA standards and regulations. All work shall be neat and of a professional quality, as determined by the engineer.

Site preparation. Site preparation (mobilization and demobilization, clearing and grubbing, structure removal, pollution control, and water for construction) shall follow NRCS PI Supplemental Construction Specifications or others as appropriate.

Pipe storage. If pipe is stored outside for more than 15 days, it shall be covered by a durable, light-colored, opaque material, and vented to prevent heat buildup. Avoid awkward placement of pipe that could affect pipe integrity and strength.

HDPE pipe installed on the surface. Polyethylene plastic pipe, PE-3408 or better, up to 4-inch diameter, may be laid on the ground surface at locations where minimal hazards are imposed by fire, farm operations, traffic, vandalism, or theft. Snaking the pipe is necessary for surface pipes and an additional minimum 4% must be added to the length to accommodate the expansion and contraction. Surface pipe laid on steep slopes shall be anchored to control creep and resulting added stresses at intervals of no less than 200 feet. At vehicle crossings, burial, encasement of pipe, or other approved methods shall be used.

Depth of cover. Pipe shall be installed at sufficient depth below the ground surface to provide protection from hazards imposed by traffic crossings, farming operations, freezing temperatures, or soil cracking. The minimum depth of cover for pipe susceptible to any of these hazards shall be according to **Table 3**.

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 the values in **Table 4**.

Table 3 - Normal Minimum Cover Depth

Pipe diameter (in)	Depth of cover (in.)
½ through 2-1/2	18
3 through 5	24
6-18	30
More than 18	36

Table 4 - Non-Hazardous Minimum Cover Depth

Pipe diameter (in)	Depth of cover (in.)
½ through 1-1/2	6
2 through 3	12
4 through 6	18
More than 6	24

At locations where extra protection is needed such as vehicle crossings, encasement pipe or other approved methods shall be used.

In areas where burning is very likely, such as in sugarcane fields, the pipe shall be buried a minimum of 18 inches. Where peat or muck exists in their normal layered pattern, solvent-welded joints shall be used at all connections of PVC pipe. Where coarse sand or cement layers exist, rubber gasket joints may be used following normal bedding procedures.

In shallow trenches, 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 2 feet wider than the trench and the side slopes no steeper than 6H:1V. If extra protection is needed at vehicle crossings, encasement pipe or other approved methods may be used.

Minimum cover for corrugated PE is 12 inches. The maximum depth of cover for all plastic pipe sizes shall be 4 feet.

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

The minimum width of the trench 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 and compacted under the haunches and along the side of the pipe. The trench width shall depend upon the type of compaction of the backfill, and the width shall be the pipe diameter plus:

- a. For water saturation - not less than 12 inches or more than 15 inches.
- b. For mechanical compaction - not less than 24 inches or more than 36 inches.

If the trench is precision excavated and has a semicircular bottom that fits the pipe, the width shall not exceed the outside diameter of the pipe by more than 10 percent.

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

If rocks or any other materials that can damage the pipe are encountered, the trench bottom shall be undercut a minimum of 4 inches below final grade and filled with bedding material consisting of sand or compacted fine-grained soils no greater than ½" diameter.

Pipelines having a diameter of ½ through 2-1/2 inches that are placed in areas not subject to vehicular loads and in soils that do not crack appreciably when dry, may be placed by using "plow-in" equipment instead of conventional trenching.

Pipe Placement. Care shall be taken to prevent permanent distortion and damage when handling the pipe. The pipe shall assume near-soil temperature before placing backfill. 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.

If the pipe is assembled above ground, it should be lowered into the trench, taking care to not drop it or damage it against the trench walls.

Joints and connections. All joints and connections shall be installed to withstand the design maximum pressure for the pipeline without leakage. The inside of the pipe shall be free of any obstruction that may reduce its capacity below the design requirements.

For pipe with bell joints, 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.

The maximum bell joint deflection shall follow the manufacturer's recommendation. In curved sections, where joint deflection is greater than recommended, deflection couplings or elbows shall be used. A pipe section shall never be bent, deformed, blocked, or braced to hold a curve.

Allow heat fused and solvent-cemented joints to cool or cure for the minimum prescribed time before moving the pipe.

Fittings made of steel or other metals susceptible to corrosion shall be adequately protected by being wrapped with plastic tape or by being coated with a substance that has high corrosion-preventative qualities. If plastic tape is used, all surfaces shall be thoroughly cleaned and coated with a primer compatible with the tape before wrapping.

Thrust blocks. Thrust blocks shall be used at all major changes in alignment, under valves, intersections, and dead ends. Thrust blocks must be formed against a solid hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete with a compressive strength of no less than 2000-psi and framed with wood or soil to restrain the freshly placed concrete. The space between the pipe and trench wall shall be filled with concrete to the height of the outside diameter of the pipe or as specified by the manufacturer. Allow sufficient time for concrete to cure before burying the thrust block or pressurizing the pipe.

Tracer wire. Where pipes are located close to utilities, roads, right-of-ways, in locations where development is anticipated, or as indicated in the drawings, tracing wire shall be installed. At a minimum, 14 gauge braided copper tracer wire shall be secured to the top of the pipes and shall surface at all ends and air vents. Wire shall be continuous or have an approved splice. Tracer tape is acceptable.

Water testing. The pipeline shall be tested for pressure strength, leakage, and proper functioning. The tests may be performed before backfilling or anytime after the pipeline is ready for service. Partial backfills needed to hold the pipe in place during testing shall be placed as specified in the **Initial backfill** section.

The line shall be slowly filled with water. Adequate provisions 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.

The pipeline shall be tested to insure that it functions properly at design capacity. At or below design capacity, there shall be no objectionable flow conditions.

Initial backfill. Normally, hand, mechanical, or water packing methods may be used; however, all special backfilling recommendations of the pipe manufacturer shall be met.

The initial backfill material shall be soil or sand that is free from rocks or stones larger than 1 inch in diameter and earth clods greater than about 2 inches in diameter. Initial backfill shall extend 6 inches above the top of the pipe.

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

If backfilling is done by hand or mechanical means, the initial fill shall be compacted firmly around and above the pipe as required to provide adequate lateral support to the pipe.

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

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

The final backfill material shall be free of large rocks 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 and the backfill will be level or slightly mounded with the natural ground or at 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.

Exposed PVC. Exposed PVC shall be specifically manufactured for use in above ground applications or shall be coated with a heavily pigmented latex or acrylic paint, chemically compatible with PVC. While color is not particularly important for UV protection, the use of light paint colors will reduce pipe temperature.

Above-ground pipe installation. Saddles and supports shall be installed and constructed as designed by the engineer and shall be approved prior to commencement of construction.

Vegetative cover. Permanent vegetation will be established following Conservation Practice Standard 342, Critical Area Planting.

CONSTRUCTION OPERATIONS AND WORKMANSHIP

Construction operations shall be carried out in such a manner and sequence that air and water pollution and erosion are minimized and held within legal limits.

The owner, operator, contractor, or other persons will conduct work and operations will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

QUALITY ASSURANCE AND GUARANTEE

The contractor shall contact the local NRCS office at least 24 hours in advance of any pipe that will be buried for quality assurance checks relating to pipe grade and appurtenances, bedding conditions, trench width and depth, and suitability of backfill material. Pipe and appurtenances that are of questionable quality (sun burnt PVC, gouged pipe, etc.) shall be subject to rejection at NRCS discretion.

The manufacturer or supplier of pipe materials shall supply a statement certifying that all pipe and materials have met the standards and specifications as described in this specification, as applicable.

The installing contractor shall certify that the installation complies with the requirements of this specification and NRCS Conservation Practice Standard 430. They 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 pipes used.

If requested by the engineer, a qualified testing laboratory shall certify with supporting test results that the pipe meets the requirements in this specification.

MEASUREMENT

The quantity of each size, type, and class of pipe shall be determined to the nearest foot by measurement of the laid length of pipe along the crown centerline of the conduit.

BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by inspections to insure compliance with all provision of this specification and to the drawings.

REFERENCE DOCUMENTS

American Society for Testing and Materials (ASTM)

- ASTM D1527 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
- ASTM D1784 Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds
- ASTM D1785 Standard Specification for PVC Plastic Pipe, Schedules 40, 80, and 120
- ASTM D2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- ASTM D2235 Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
- ASTM D2239 Standard Specification for Polyethylene Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
- ASTM D2241 Standard Specification for PVC Pressure-Rated Pipe (SDR Series)
- ASTM D2466 Standard Specification for PVC Plastic Pipe Fittings, Schedule 40
- ASTM D2467 Standard Specification for PVC Plastic Pipe Fittings, Schedule 80
- ASTM D2564 Standard Specification for Solvent Cements for PVC Plastic Piping Systems
- ASTM D2609 Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
- ASTM D2672 Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement
- ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- ASTM D3035 Standard Specification for Polyethylene Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
- ASTM D3965 Standard Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings
- ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F714 Standard Specification for Polyethylene Plastic Pipe (SDR-PR) Based on Outside Diameter
- ASTM F771 Standard Specification for Polyethylene (PE) Thermoplastic High-Pressure Irrigation Pipeline Systems
- ASTM F2306 Standard Specification for 12-in to 60-in Annular Corrugated Profile-Wall Polyethylene Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

American Water Works Association (AWWA)

- AWWA C900 Standard for PVC Pressure Pipe and Fabricated Fittings for Water Transmission and Distribution, 4-in through 12-in
- AWWA C905 Standard for PVC Pressure Pipe and Fabricated Fittings for Water Transmission and Distribution, 14-in through 48-in
- AWWA C906 Standard for PE Pressure Pipe and Fittings for Water Distribution and Transmission, 4-in through 63-in