

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

PIPELINE

(Ft.)

CODE 516

DEFINITION

Pipeline having an inside diameter of 8 inches or less.

PURPOSE

This practice may be applied as part of a resource management system to achieve one or more of the following purposes:

- Convey water from a source of supply to points of use for livestock, wildlife, or recreation.
- Reduce energy use.
- Develop renewable energy systems (i.e., in-pipe hydropower).

CONDITIONS WHERE PRACTICE APPLIES

Where it is desirable or necessary to convey water in a closed conduit from one point to another.

CRITERIA

General Criteria Applicable to All Purposes

Utilities and Permits. The landowner and/or contractor shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including the Illinois Department of Agriculture, US Army Corps of Engineers, US Environmental Protection Agency, Illinois Environmental Protection Agency and Illinois Department of Natural Resources – Office of Water Resources, or document that no permits are required.

Capacity. For livestock water, the installation shall have a capacity to provide seasonal high daily water requirements of 20 gallons per day per animal unit for sheep, 30 gallons per day

per animal unit for all other animals (animal unit = 1000 live weight).

For recreation areas, the water capacity shall be adequate for all planned uses. Typical examples are drinking water, fire protection, showers, flush toilets, and irrigation of landscaped areas.

Additional water capacity will be provided for wildlife when applicable.

Sanitary protection. If water from the pipeline is to be used for human consumption, applicable state and local regulations shall be met.

When a pipeline serving livestock is supplied from a utility that provides potable water, an approved method for eliminating backflow must be installed in accordance with all state and local regulations.

Pipe. All pipe must withstand the pressure it will be subjected to, including hydraulic transients, internal pressures and external pressures. As a safety factor against surge or water hammer, the working pressure should not exceed 72% of the pressure rating of the pipe and the design flow velocity at system capacity should not exceed 5 ft/sec. If either of these limits is exceeded, special consideration must be given to flow conditions and measures must be taken to adequately protect the pipeline against surge.

Steel pipe shall meet the requirements of AWWA Specification C-200.

To ensure adequate strength, pipe with a minimum pressure rating of 150 psi shall be used when burying the pipe or in systems that operate above 50 psi.

Plastic pipe shall conform to the requirements of the following ASTM specifications, as applicable:

- D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
- D 1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D 2104 Polyethylene (PE) Plastic Pipe, Schedule 40
- D 2239 Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
- D 2241 Poly(Vinyl Chloride) (PVC), Pressure-Rated Pipe (SDR)
- D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)
- D 2447 Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
- D 2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings
- D 2737 Polyethylene (PE) Plastic Tubing
- D 2672 Joints for IPS PVC Using Solvent Cement
- D 3035 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
- AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches
- AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inches

Plastic pressure pipe fittings shall conform to the following ASTM specifications, as applicable:

- D 2464 Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- D 2466 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
- D 2467 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40
- D 2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
- D 2683 Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

D 3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

Solvents for solvent-welded plastic pipe joints shall conform to the following ASTM specifications, as applicable:

D 2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings

D 2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

Rubber gaskets for pipe joints shall conform to the requirements of ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Drainage. Valves or unions shall be installed at low points in the pipeline so that the line can be drained as needed. Check valves shall be installed as needed to protect groundwater quality or maintain a full pipeline.

Vents. Design shall provide for entry and removal of air along the pipeline, as needed, to prevent air locking or pipe collapse. If parts of the line are above the hydraulic gradient, periodic use of an air pump may be required. Provisions shall be made for pressure relief, air relief and vacuum relief as needed to protect the pipeline.

Joints. Watertight joints that have a strength equal to that of the pipe shall be used. Couplings must be of material compatible with that of the pipe. If they are made of material susceptible to corrosion, provisions must be made to protect them.

Protection. When steel pipe is used, interior protective coatings shall be provided in accordance with NRCS Conservation Practice Standard 430, Irrigation Pipeline. If a coal-tar enamel protective coating is needed for corrosion protection, the coating shall meet the requirements of AWWA Specification C-203.

Steel pipe installed above ground shall be galvanized or shall be protected with a suitable protective paint coating, including a primer coat and two or more final coats.

Plastic pipe installed above ground shall be resistant to ultraviolet light throughout the intended life of the pipe.

All pipes shall be protected from hazards presented by traffic, farm operations, freezing temperatures, fire, thermal expansion and contraction. Reasonable measures should be taken to protect the pipe from potential vandalism.

Unless otherwise protected, plastic pipe must be buried at least 24 inches deep for ordinary field traffic. When crossing under a road, the pipeline shall be buried deeper or protected from collapsing by placing the pipeline in a steel or concrete conduit.

Other means of protection must be provided if the depth required for protection is impractical because of shallow soils over rock or for other reasons. Abrupt changes in grade must be avoided to prevent damage to the pipe.

Pipelines must be buried below the frost depth or otherwise protected from freezing. If the pipeline cannot be protected from freezing, it must be provided with valves properly located so the pipe can be drained during periods of freezing temperatures.

Vegetation. Disturbed areas shall be established with vegetation or otherwise stabilized as soon as practical after construction. Seedbed preparation, seeding, fertilizing, and mulching shall conform to NRCS Conservation Practice Standard 342, Critical Area Planting.

Visual resources. The visual design of pipelines and appurtenances in areas of high public visibility shall be carefully considered.

Additional Criteria Applicable to Reduce Energy Use

Provide analysis to demonstrate reduction of energy use from practice implementation.

Reduction of energy use is calculated as average annual or seasonal energy reduction compared to previous operating conditions.

Additional Criteria Applicable to Develop Renewable Energy Systems

Renewable energy systems shall meet applicable design criteria in NRCS and/or industry standards, and shall be in accordance

with manufacturer's recommendations. Hydropower systems shall be designed, operated, and maintained in accordance with the Microhydropower Handbook, Sections 4 and 5, as appropriate.

CONSIDERATIONS

No special considerations have been identified for this practice.

PLANS AND SPECIFICATIONS

Plans and specifications for installing pipelines shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. If the pipeline is a component of a system that includes additional conservation practices, the information necessary to construct these additional practices will also be conveyed on the plans.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan specific to the type of installed pipeline shall be provided to the landowner. The plan shall include, but not be limited to, the following provisions:

- Inspect the pipeline and associated practices annually and after significant storm events to identify repair and maintenance needs;
- Protect pipeline from damage by equipment, vehicles, and livestock;
- Check for leaks and improper operation. Repair any damage as soon as possible;
- Repair any eroded areas above or around the pipeline. Reestablish vegetative cover immediately after erosion is repaired;
- Mark pipeline locations in areas where potential damage could occur;
- Record the location and approximate depth of the pipeline on a map;
- Open and close valves to prevent excessive water hammer;
- Ensure the system fills at the specified rate requirements and provides the required volume and pressure;

- Inspect and test valves, pressure regulators, pumps, switches and other appurtenances;
- Maintain erosion protection at outlets;
- Check for debris, minerals, algae and other materials which may restrict system flow; and
- Drain and/or provide for cold weather operation of the system.

REFERENCES

McKinney, J.D., et al. Microhydropower Handbook, IDO-10107, Volumes 1 & 2. U.S.

Department of Energy, Idaho Operations Office.

USDA-NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 3, Hydraulics.

USDA-NRCS, National Range and Pasture Handbook, NRCS Grazing Lands Technology Institute.

USDA-NRCS, Missouri Livestock Watering System Handbook.

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS CONSTRUCTION SPECIFICATION
PIPELINE

General

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

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used. Contractor shall be assured that all state laws concerning buried utilities have been met.

All trees, stumps, roots, brush, weeds, and other objectionable materials shall be removed from designated work area.

Materials

Materials and fabrication shall be as specified on the drawings. Plastic pipe 2 inches or less in diameter meeting ASTM specifications D1785, D2239, D2241, or AWWA C901 may be used. Plastic pipe over 2 inches in diameter shall be polyvinyl chloride (PVC) 1120 or 1220 conforming to ASTM D1785 or D2241. The ASTM or AWWA designation shall be stamped on the pipe. Steel pipe shall meet ASTM specification A53 or AWWA specification C202. Other plastic pipe meeting IL-NRCS Conservation Practice Standard (516) Pipeline is acceptable.

To ensure adequate strength, pipe with a minimum pressure rating of 150 lbs/in² shall be used when burying the pipe or working with systems that operate at over 50 lbs/in².

Placement

Placement of the pipeline shall be as shown on the plans or as staked. The pipe shall be free of dirt and other materials before assembling. Flexible plastic pipe shall be placed in a "snake-like" position to provide expansion and contraction with temperature change.

Other parts of the water system shall be installed and connected to the pipeline as specified.

Pipelines shall be placed so that they are protected against hazards imposed by traffic, farm operations, freezing temperatures, or soil cracking. Minimum depth of burial shall be as shown on drawings. Unless otherwise specified, plastic pipe shall be buried at least 24 inches for ordinary field traffic. When crossing under a road, the pipeline shall be buried deeper or protected from collapsing by placing in a steel or concrete conduit.

Other means of protection must be provided if the depth required for protection is impractical because of shallow soils over rock or for other reasons. Abrupt changes in grade must be avoided to prevent damage to pipe.

Pipelines shall be buried below frost line or otherwise be protected from freezing. If pipeline cannot be protected from freezing, the pipeline will be provided with valves properly located so the pipe can be drained during periods of freezing temperatures.

Trenches for plastic pipelines shall be free of rocks and other sharp-edged materials, and pipe shall be carefully placed to prevent damage.

Flexible plastic pipelines may be placed by plow-in equipment if soils are suitable and rocks and boulders will not damage the pipe material.

All plastic pipe connections designed to be solvent-welded joints will use the manufacturer's recommended solvent cement. Allow solvent-welded joints to cure according to manufacturer's guidelines prior to moving pipe and pressure testing. Solvent-welding shall not be done at temperatures below freezing.

Testing

Prior to backfilling, pipelines shall be pressure tested by one of the following methods:

The pipe shall be filled with water and tested at design working head or a minimum head of 10 feet, whichever is greater. All leaks shall be repaired and the test shall be repeated before backfilling.

Pipelines shall be pressure tested at the design pressure for 2 hours. The allowable leakage shall not be greater than 1 gallon per diameter inch per mile. If the test exceeds the 1-gallon per diameter inch per mile rate, the defect shall be repaired until retest show that the leakage is within the allowable limits, except that all visible leaks shall be repaired.

Backfilling

All backfilling shall be completed before the line is placed in service. For plastic pipe, the

initial backfill shall be of selected material that is free from rocks or other sharp-edged material that can damage the pipe.

Deformation or displacement of the pipe must not occur during backfilling.

Plastic pipelines installed by the plow-in method require surface compaction and shaping in addition to the normal plow-in operations.

Mound soil over pipe to allow for settlement. Provisions shall be provided for stabilizing disturbed areas and controlling erosion, as necessary.

Vegetation

Topsoil shall be added, if needed to establish vegetation. Refer to Conservation Practice Standard 342, Critical Area Treatment, for seeding and mulching recommendations or equivalent.

Additional Details:

**NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS OPERATION AND MAINTENANCE**

PIPELINE

An operation and maintenance plan shall be developed and established by the producer to maintain the pipeline capacity and associated vegetative cover. Items to consider are:

- Protect pipeline from damage by farm equipment, vehicles, and livestock.
- Check for leaks and improper operation. Repair any damage as soon as possible after being noted.
- Repair any eroded areas that are hazardous to the pipeline. Reestablish vegetative cover immediately where erosion has occurred.
- Mark pipeline locations in areas where potential damage could occur by other activities.
- Record on a map the location of pipeline and approximate depth.
- Check to ensure needed volume of water is being supplied at the designed pressure.
- Opening/closing valves to prevent excessive water hammer.
- When quick connects are used, ensure proper operation and adequate designed delivery rate.
- Inspect and test valves, pressure regulators, pumps, switches and other appurtenances;
- Check for debris, minerals, algae and other materials that may restrict system flow; and
- Drain and/or provide for cold weather operation of the system.

Additional Details:
