

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**ABOVE GROUND, MULTI-OUTLET PIPELINE**

(Ft.)

**CODE 431**

**NOTE:** This practice is now included in Conservation Practice 443, Irrigation System, Surface and Subsurface, and will be removed from the eFOTG 9/30/13.

**DEFINITION**

A water distribution tubing consisting of aluminum, polyvinyl chloride (PVC), or lay-flat polyethylene pipeline with closely spaced orifices or gates.

**PURPOSES**

- To increase water use efficiency on irrigated land
- To reduce irrigation-induced soil erosion
- To reduce excessive runoff, flooding, or ponding associated with inefficient irrigation water use
- To improve the productivity, health and vigor of the crop
- To increase the quantity and quality of feed and forage for domestic animals

**CONDITIONS WHERE PRACTICE APPLIES**

The practice applies to irrigable land suited to surface application methods. This practice shall not be used in lieu of buried pipelines for conveyance systems. However, reaches of un-gated pipe may be used as follows:

- To obtain necessary working pressure for the system
- To convey water between fields (typically less than 300 feet)
- To convey water to various points within a field
- For splitting irrigation runs as in surge irrigation

- Where rock precludes the installation of buried pipelines

Water supplies and rates of irrigation delivery for the area served by the multi-outlet pipeline shall be sufficient to make irrigation practical for the crop to be grown and for the method of application.

**CRITERIA**

**General Criteria Applicable To All Purposes**

**Pipe sizes.** For durability and transportability, rigid pipes shall be a minimum of 6 inches in diameter and not greater than 12 inches in diameter.

**Working pressure.** The maximum working pressure for rigid pipe shall be 10 pounds per square inch or 23 feet of head. Excess working pressure shall be reduced to acceptable levels by installing an appropriate head control appurtenance.

For lay-flat polyethylene pipe, the manufacturer's recommendations for maximum allowable working pressure shall be followed. If the manufacturer's recommendations are not available, the hoop stress formula in Chapter 52 of National Engineering Handbook (NEH) Part 636, *Structural Engineering*, shall be used to determine maximum working pressure, using a safety factor of 1.5.

**Friction losses.** For design purposes, friction head losses shall be no less than those computed by the Hazen-Williams equation, using roughness coefficients of  $C = 130$  for aluminum pipe and  $C = 150$  for plastic or lay-flat polyethylene pipe. The use of PHAUCET, other appropriate computer software, or a multiple

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service or download it from the electronic Field Office Technical Guide (eFOTG).

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outlet factor shall be used in computing losses when appropriate. Refer to Chapter 15, "Irrigation," in NEH Part 650, *Engineering Field Handbook*, for guidance.

**Flow velocity.** Velocity in the pipeline when operating at system capacity shall not exceed 7 feet per second unless appropriate surge protection is accounted for.

**Capacity.** The design capacity of the pipeline shall be sufficient to deliver an adequate irrigation stream to the design area for the planned irrigation method.

**Outlet gates.** Individual outlet gates shall have the capacity at design working pressure to deliver the required flow to a point at least 0.3 foot above the field surface.

**Head requirement.** The working head shall not be less than 0.5 foot above outlet gates, unless a detailed design or manufacturer's literature indicates that a lower head is adequate to deliver the required water to the field.

Where either the design working head exceeds 5 feet or where stream flows are erosive, an effective method of energy dissipation shall be installed on each gate, or permanent vegetation shall be planted along the pipeline to provide erosion control.

**Flushing.** A suitable outlet shall be installed at the end of the pipeline, if needed, for flushing the line free of sediment or other foreign material.

**Materials.** Rigid pipe shall be aluminum or plastic material certified for above ground use. All fittings and couplers shall equal or exceed the pressure rating of the pipe with which they will be used. They shall be made of material that is recommended by the manufacturer for use with the pipe

Rigid pipe and appurtenances shall be furnished with a coupling system that is interchangeable with the selected pipe material.

Rubber gaskets shall be according to the manufacturer's standard design dimensions and tolerances for the pipe material selected. They shall be of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to effect a positive 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.

Minimum wall thickness for aluminum-gated pipe shall be 0.050 inch for 6 through 10 inches in diameter and 0.058 inch for 12-inch diameter pipe.

Corrosion protection shall be provided for aluminum pipe when one of the following occurs:

- It is conveying water with a copper content exceeding 0.02 parts per million (ppm).
- It is in contact with soil having a resistivity of less than 500 ohm-cm.
- It is in contact with soil having a pH less than 4 or greater than 9.

Minimum wall thickness of rigid PVC pipe shall be 0.120 inch. The pressure rating of the pipe shall be 22 pounds per square inch (psi) or greater, prior to gate installation.

Minimum wall thickness of lay-flat polyethylene pipe shall be 6 mil (.006 inch).

**Related structures.** An open ditch supply shall include a permanent water control structure as the inlet to multi-outlet pipe.

When the water supply for lay-flat polyethylene pipe is greater than 0.5 foot above ground, a rigid pipe shall be used to convey water between the outlet and the coupling of lay-flat polyethylene pipe.

## CONSIDERATIONS

Provisions for thrust control should be provided at locations subject to pipe movement.

Applicability of future surge or automation alternatives should be included when preparing the design.

The water source and potential trash types and amounts should be considered when evaluating screen types and sizes and in the design of an inlet screen.

Effects on the water budget in any downstream drainage should be evaluated (including water quality, volume of runoff, and rates of runoff).

Effects on wetlands and water-related wildlife should be considered.

Effects on water flows and aquifers and the effects on other water uses and users should be evaluated.

Disposal of lay-flat polyethylene pipe and the potential of recycling should be considered.

Anchoring lay-flat polyethylene tubing should be included when winds may cause it to move.

A water-measuring device to assist in irrigation water management should be incorporated in the design.

### **PLANS AND SPECIFICATIONS**

Plans and specifications shall be prepared to show site-specific details. The drawings and specifications shall show pipe location(s), pipe size(s), construction details for the inlet structure and screen (as applicable), sizes and construction details for head control facilities, flow measurement device (when appropriate) and gate spacing, and erosion details (as appropriate).

If lay-flat polyethylene pipe is included in the plan and the manufacturer's recommendations for working pressure are not available, an appropriate formula or table for determining maximum working pressure shall be included in the practice specification.

Plans should also include gate openings or orifice sizes necessary to deliver the design flows as determined by appropriate surface irrigation design procedures.

### **OPERATION AND MAINTENANCE**

The operation and maintenance plan for the system shall include the following:

- Requirements for flushing pipe
- Requirements for cleaning and repairing screens and structures
- Requirements for replacing individual gates and gaskets
- Requirements for off-season storage and handling of pipe
- Requirements for anchoring pipe where wind conditions require
- Recommendation for recycling lay-flat polyethylene pipe (where recycling is available)

If the source of water supply is from a water well, the operation and maintenance plan shall note that the presence of sand in the pipeline may indicate problems with the water well.