

**NATURAL RESOURCES CONSERVATION SERVICE  
PACIFIC ISLANDS AREA**

**CONSERVATION PRACTICE STANDARD**

**PIPELINE  
(Ft.)  
CODE 516**

**DEFINITION**

Pipeline having an inside diameter of 8 inches or less.

**PURPOSE**

To convey water from a source of supply to points of use for livestock, wildlife, or recreation.

**CONDITIONS WHERE PRACTICE APPLIES**

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

**CRITERIA**

**Capacity.** For livestock water, the installation shall have a capacity to provide seasonal high daily water requirements for the number and species of animals to be supplied *listed in Table 1.*

*Table 1*

<i>Animal</i>	<i>Gallons per Animal per Day</i>
<i>Beef cattle</i>	12
<i>Dairy cow</i>	25
<i>Goat</i>	2
<i>Hog</i>	4
<i>Horse</i>	12
<i>Sheep</i>	2

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 *and the pipe must be marked or certified for potable water supply by the National Sanitation Foundation (NSF).*

**Pipe.** All pipes 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.

**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 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. When pipelines are laid over rolling terrain, high points in the line will tend to collect air. If summits occur in a pipeline, air release valves should be used to release entrapped

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [electronic Field Office Technical Guide](#).

air. 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 430FF, Steel Pipe. 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, fire, thermal expansion and contraction. Reasonable measures should be taken to protect the pipe from potential vandalism.

**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.

## **DESIGN PROCEDURES**

**General.** The design procedure and tables contained in the *Hawaii Stockwater Handbook* and the *Hawaii supplement to the*

*Engineering Field Handbook (EFH), Part 650, Chapter 3, can be used to properly size pipeline systems. This procedure is limited to pipelines up to 2-1/2 inches in diameter, 3,000 feet long, 100 feet change in elevation, and 100 psi or less meter pressure. Pipelines above these limits will require a separate design.*

**High Density Polyethylene Pipe.** *Thermal expansion shall be considered in the design of high density polyethylene pipe systems laid on the ground surface. The pipe shall be restrained in areas where pipe movement is likely to cause damage to the pipe itself, from moving up against existing structure or rock outcrop, attached to surrounding structures, steep slopes, and make access to the right of way difficult. The pipe section before the connection to a trough should be anchored.*

*Anchors may be earth berms or embankment, buried in place, cast in place or bolted on concrete blocks, and timber supports with cradle.*

*The pipe shall be anchored and "snaked" at intervals along its length allowing the pipe to deflect laterally between the anchors. The deflection achieved by "snaking" the pipe shall have the sum of the individual deflections equivalent to the lateral deflection of the pipe. The amount of lateral deflection is to be calculated using the following equation.*

$$\Delta W = 0.0067 * L * \sqrt{\Delta T}$$

*Where:*

$\Delta W$  = Lateral deflection of the pipe in feet

L = Length of pipe between anchors in feet

$\Delta T$  = Temperature variation in degrees Fahrenheit

*The lateral deflection  $\Delta W$  shall be added to the length of pipe between anchors.*

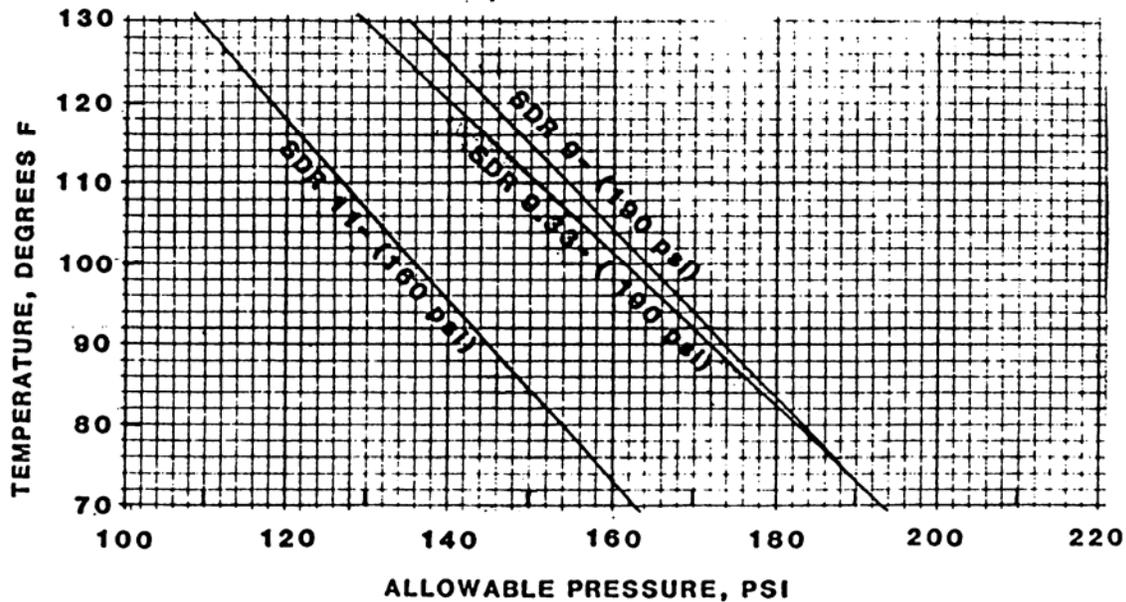
*The minimum bending radius of the pipe shall not be exceeded. The minimum bending radius is the pipe diameter in inches multiplied by 50. To avoid exceeding the bending radius standard fabricated*

polyethylene fittings shall be used. Anchors shall be used on sharp bends to prevent all pipe movement from concentrating in this area.

The temperature of the water being conveyed will have an effect on the service capability of the pipe. The allowable pressure rating of the

pipe shall be decreased for fluid or environmental temperatures above 73°F, as shown in Figure 1. Pipes shall not be installed in areas where the temperature will exceed 130°F.

**FIGURE 1**  
**ALLOWABLE PRESSURE VS. TEMPERATURE**



SDR 9 - Nipak, and Polaris(200 psi) PE 3408

SDR 9.33 - Drisco 8600

### 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.

The Engineering Field Handbook, *Part 650*, Chapter 5, will guide the development of plans.

The following should be included in the plan:

1. Location map of pipeline.
2. Number of animals to be served.
3. Length of pipeline.
4. Pressure rating of pipe.
5. Pipe material and size.

6. *For plastic pipe, the burial depth.*
7. *For HDPE pipe, anchor locations and additional length of pipe*
8. *Location and type of valves.*
9. *Operating pressures at outlets.*

## **REFERENCES**

Engineering Field Handbook

## **OPERATION AND MAINTENANCE**

*The Pacific Islands Area Operation and Maintenance Plan for Pipeline shall be prepared for and reviewed with the client.*

The plan shall include, but not be limited to, the following provisions:

- Opening/closing valves to prevent excessive water hammer;
- Filling at the specified rate requirements;
- Inspecting and testing valves, pressure regulators, pumps, switches and other appurtenances;
- Maintaining erosion protection at outlets;
- Checking for debris, minerals, algae and other materials which may restrict system flow; and
- Draining operation of the system.