NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
SOUTH DAKOTA SUPPLEMENTS ITALICIZED

PIPELINE

(*ft.*)
CODE 516

DEFINITION

Pipeline installed for conveying water for livestock or for recreation.

PURPOSE

To convey water from a source of supply to points of use.

CONDITIONS WHERE PRACTICE APPLIES

Where conveyance of water in a closed conduit is desirable or necessary to conduct water from one point to another, to conserve the supply, or for reasons of sanitation.

PLANNING CONSIDERATIONS

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff and infiltration. Compare to centralized water facilities that has increased soil compaction because of traffic livestock, vehicles, and humans.
2. Effects on surface and ground water of broken pipelines.

Water Quality

1. The impact of water available at remote sites as a factor in keeping livestock out of streams and lakes, with the resulting reduction in bank erosion, sediment yield, and the direct deposit of manure in water courses.
2. Effects of bacteria, nutrients, salts and organic matter on surface and ground water because of increased recreation activity caused by the availability of water.
3. Effects of erosion and sediment yield from disturbed areas during construction.

DESIGN CRITERIA

Distribution. *Watering facilities should normally meet the following guidelines:*

Type of Terrain	***Maximum distance from forage to water***
Gentle relief	*1 mile*
Rough relief	*1/2 mile*

Capacity - Livestock Water *- Pipeline designs for livestock water must have the capacity to supply at least the following minimum:*

MINIMUM WATER USE PER ANIMAL

Animal	**Gal/Day**
Milking cow	45
Dry cow	30
Heifer	15
Calves (1-1/2 gal/100 lb. body weight)	10
Swine, finishing	5
Nursery	1
Sow & litter	8
Gestating sow	6
Horses and beef animals	
East of Missouri River	12
West of Missouri River	20
Sheep and goats	2
100 chicken layers	9
100 turkeys	15

FARMSTEAD EQUIPMENT MINIMUM WATER SUPPLY

Automatic waterers	*Gallons per Minute*
Cattle, hogs, or sheep	
(20-40 head per bowl)	*2*
Poultry (100-150 layers	*1*
Cleaning hose for milkhouse and dairy utensils.	*5*
Cleaning and manure removal hose for milking barn or hog house	*10*
Outdoor hydrant for uses other than firefighting	*5*
Firefighting hydrant	*20*

(Suggested reference: Midwest Plan Service Structures and Environment Handbook - MWPS-1.)

On large, extensive systems, peak use based on maximum flow from all outlets may not be expected to occur. In these cased, capacity may be based on the number of outlets expected to be in use and the number of livestock served by the outlets. When the basis of pipeline design considers storage, refer to South Dakota Engineering Standard (614), "Troughs and Tanks."

***Capacity - Recreation** - The capacity shall be adequate for all planned uses of the water such as drinking, fire protection, showers, flush toilets, and irrigation of landscaped areas.*

Capacity - Domestic Use - *The capacity must be adequate for all planned uses. Normal minimum design capacity shall be 10 gallons per minute (gpm) and 360 gallons per day, per dwelling unit.*

On group systems where multiple headquarters outlets are planned or anticipated, simultaneous system design for headquarters shall be based on the following:

Number of Dwellings	***Minimum Gallons per Minute (gpm)***
1	*10*
2	*20*
3	*28*
4	*35*
5	*40*
10	*65*
14	*85*

***Sizes** - Pipeline sizes, except as outlined below, shall be based on water requirements and economic considerations. The minimum pipeline nominal diameter shall be 3/4 inch for pipelines under pressures grater than 10 psi and 1 1/4 inch for pipelines with gravity flow. In areas where deposits in pipelines occur, the minimum pipe size shall be 1 1/2 inch diameter.*

Minimum capacity per pipeline must be 2 gpm or more, except within 1000 feet of dwelling or farmsteads (on the same property); minimum pipeline capacity must be 10 gpm or more.

***Capacity - Wildlife** - Additional capacity will be provided for wildlife water requirements where applicable. Daily water consumption may be calculated at one gallon per day per 100 pounds of body weight.*

Sanitary protection. *When water from the pipeline is likely be used for human consumption, the requirements outlined in the State Plumbing Code must be met. If more than 15 dwellings or 25 year-round residents are served by the system, it is classified by South Dakota drinking water standards as a "Community Water System" and the plans and specifications require approval of the South Dakota Department of Environment and Natural Resources (DENR), Division of Environmental Regulation.*

Contaminated water must be disinfected before use for human consumption.

Systems utilizing water for domestic purposes from a well, with water of satisfactory quality, shall be disinfected by shock-chlorination prior to use. The chlorine concentration should be 200mg/l; and should remain in the system for 8 hours. Chlorine

powder, tablet, or solutions of various strengths may be used. On smaller systems, laundry bleach containing 5 percent available chlorine may be used at the rate of 3 pints per 100 gallons of water in well or piping system.

To prevent reversal of flow or contamination on systems used for human consumption, double spring-loaded check valves shall be used on all outlets or branch lines. Two single check valves may be used as an alternate

Pipe. *Where water is to be used for human consumption the requirements of the National Sanitation Foundation (NSF) shall be met. The pipe must be suitably marked.*

Pipes must meet the following requirements or must be designed by a registered professional engineer.

Steel pipe shall meet the requirements specified in ASTM-A-120 or in AWWA Specification C-200. If because of local conditions, a coal-tar enamel protective coating is needed for steel pipe, the coating shall meet the requirements of AWWA Specification C-203. Plastic pressure pipe shall be suitable for underground use. The pipe shall conform to the requirements of the following ASTM specifications:

D 1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2104 Polyethylene (PE) Plastic Pipe, Schedule 40
D 2241 Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR)
D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)
D 2239 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter
D 3035 Polyethylene (PE) Plastic Pipe (SDR-PR), Based on Controlled Outside Diameter
D 2447 Polyethylene (PE) Plastic Pipe Schedules 40 and 80, Based on Outside Diameter
D 2737 Polyethylene (PE) Plastic Tubing
D 2672 Bell-End Polyvinyl Chloride (PVC) Pipe
D 2740 Polyvinyl Chloride (PVC) Plastic Tubing

Pressure pipe fitting shall conform to the requirements of the following ASTM specifications:

D 2466 Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
D 2467 Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
D 2464 Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
D 2611 Butt Fusion Polyethylene (PE) Plastic Pipe Fittings, Schedule 80 (for IPS Pipe)
D 2610 Butt Fusion Polyethylene (PE) Plastic Pipe Fittings, Schedule 40 (for IPS Pipe)
D 3036 Socket-Type Polyvinyl Chloride (PVC) Plastic Line Couplings
D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40
D 2469 Socket-Type Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80
D 2465 Threaded Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Threaded, Schedule 80
D 2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings, for Polyethylene (PEP) Plastic Pipe and Tubing
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

Solvents for solvent-welded pipe joints shall conform to the following ASTM specifications:

D 2564 Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
D 2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
D 2855 Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings

Rubber gaskets for pipe joints shall conform to the requirements of ASTM Specification F 477, Elastomeric Seals (Gaskets) for joining Plastic Pipe.

Protection from sunlight must be provided for exposed plastic pipe.

Pressure *- The maximum working pressure shall not be more than: (1) one-fourth of the bursting pressure for metal pipe, and (2) the certified working pressure stamped on plastic pipe with adjusted reductions for high water temperatures and water hammer. Design consideration must be given to flow reversal, impact and vacuum.*

(Suggested references: Unibell "Handbook of PVC Pipe," South Dakota Engineering Technical Notes Design SD-11 and Design SD-15, and Engineering Field Manual Chapters 3 and 12.)

Drainage. Valves or unions shall be installed at low points in the pipeline *for systems installed above the frost line* so that the line can be drained as needed.

Vents. *For design velocities less than eight feet per second, some provisions for removing the air must be included in the design. If parts of the line are above the hydraulic gradient, periodic pressurizing of the line or cleaning the line with an air supply may be required.*

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.

Flow Restrictors*- Flow restrictor valves should be used on group pipelines to control the rate and flow to outlets and prevent periods of no flow on sections of the pipeline. Hydrants, bypass circumvent the flow restictors during fire emergencies.*

Freezing and Mechanical Damage *- Pipelines must be designed to avoid damage form farm and ranch operation, weather, animals, soil movement, and other reasonably expected hazards.*

Pipelines used for water supply during freezing weather must be installed below the average frost line or must be protected with weatherproof insulation, automatic heat, or other effective design.

Vegetation. *Disturbed* areas shall be established to vegetation or otherwise stabilized as soon as practicable after construction. Seedbed preparation, seeding, fertilizing, and mulching shall conform to the instructions provided in technical guides.

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

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.