

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
STREAM CROSSING**

(No.)

CODE 578

DEFINITION

A stabilized area or structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles.

PURPOSE

Improve water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.

Reduce streambank and streambed erosion.

Provide crossing for access to another land unit.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where an intermittent or perennial watercourse exists and a ford, bridge, or culvert type crossing is desired for livestock, people, and /or equipment.

CRITERIA

Laws and Regulations. This practice must comply with all applicable federal, state, local, and Tribal laws and regulations. The landowner shall obtain all necessary permits prior to construction.

Location. Stream crossings shall be located in areas where the streambed is stable or where grade control can be provided to create a stable condition without decreasing streambed stability. Avoid sites where channel grade or alignment changes abruptly, excessive seepage or instability is evident, overfalls exist, or large tributaries enter the stream. Associated wetland areas shall be avoided if at all possible.

Locate crossings, where possible, out of shady riparian areas to discourage livestock loafing in or near the stream.

Stream crossings shall provide a way for normal passage of water, fish, and other aquatic animals within the channel during all seasons of the year.

Access Roads, Trails, and Walkways.

Control erosion in travel ways and loafing areas. Install measures to minimize erosion of the roadside ditch, road surface, and/or cut slopes. As necessary, divert surface runoff and roadside ditch discharge away from stream crossing approaches and cut slopes to prevent erosion.

Stream Approaches. Approaches to the stream crossing shall blend with existing site conditions where possible, and shall not be steeper than four horizontal to one vertical. The approaches shall be stable, have a gradual ascent or descent grade, and be underlain with suitable material, as necessary, to withstand repeated and long-term use. The minimum width of the approaches shall be equal to the width of the crossing surface.

Approach roads, trails, and walkways must meet appropriate South Dakota (SD) Natural Resources Conservation Service (NRCS) Conservation Practice Standards (CPS) Access Road (560) or Animal Trails and Walkways (575).

Width. The stream crossing shall provide an adequate travel-way width for the intended use. A multi-use stream crossing shall have a travel-way no less than 10 feet wide. "Livestock only" crossings shall be no less than six feet wide. Width shall be measured from the upstream end to the downstream end

of the stream crossing and shall not include the side slopes.

Side Slopes. All cuts and fills for the stream crossing shall have side slopes that are stable for the soil involved. Side slopes of earth cuts or fills shall be no steeper than two horizontal to one vertical. Rock cuts or fills shall be no steeper than 1.5 horizontal to 1 vertical.

Rock. Rock must be durable for the site conditions. Installed rock must be designed to remain in place at design flows of not less than those produced by the 10-year frequency, 24-hour duration storm.

Fencing. Use fences, as needed, to manage livestock access to the crossing and adjacent areas.

Cross-stream fencing at fords shall be accomplished with breakaway panels or similar design to allow the passage of floodwater debris during high flows. Fences crossing navigable streams must be registered with SD Department of Environment and Natural Resources.

All fencing shall be designed and constructed in accordance with SD NRCS CPS Fence (382).

Vegetation. All areas to be vegetated shall be planted as soon as practical after construction. Areas to be vegetated must be protected from grazing until the vegetation is fully established. Vegetative cover or other protection must meet SD NRCS CPSs Critical Area Planting (342), or Heavy Use Area Protection (561).

Criteria for Culvert and Bridge Crossings

Culverts and bridges shall have sufficient capacity to convey the design flow without appreciably altering the stream flow characteristics.

Bridge crossings must be designed under the direct supervision of an engineer. Bridges must be designed for the expected loading, but not less than 100 pounds per square foot of floor area. The design must be durable and must be stable during passage of flow from the 25-year frequency 24-hour duration storm.

Effective handrails and animal guards must be provided.

**SDTG Notice 291
Section IV
NRCS-OCTOBER 2009**

Combined capacity of culverts shall be sized to handle at least the 2-year duration, 24-hour peak discharge. Crossings shall be adequately protected so that out-of-bank flows safely bypass without structure or streambank damage, or erosion of the crossing cuts and fills during passage of flow from the 10-year frequency, 24-hour duration storm.

Additional culverts may be used at various elevations to maintain terrace or floodplain hydraulics. Culverts (or spillway pipes) must extend at least from the upstream fill slope surface (at inlet elevation) to the downstream toe of the fill. Outlets must be protected from excessive erosion.

The length of the culvert shall be adequate to extend the full width of the crossing, including side slopes. At least one culvert pipe shall be placed on or below grade with the existing stream bottom.

Acceptable culvert materials include concrete, corrugated metal, corrugated plastic, new or used high quality steel and other materials approved by the engineer.

Acceptable bridge materials include concrete, steel, and wood.

Criteria for Ford Crossings

When ford crossings are used, the cross-sectional area of the crossing shall not be less than the natural channel cross-sectional area or the design must meet SD NRCS CPS Grade Stabilization Structure (410).

A portion of the crossing shall be depressed at or below the average stream bottom elevation when needed to keep base flows or low flows concentrated.

Crossings must be designed to resist settlement, piping, undercutting, frost heave, ice damage, flooding, and other site hazards and loads. Crossings must be designed to be stable during the 10-year frequency, 24-hour duration discharge.

The finished top surface of the ford type stream crossing in the bottom of the watercourse shall be no higher than the original stream bottom at the upstream edge of the ford crossing. If the downstream edge of

the ford crossing is above the original stream bottom, the ford crossing shall be stabilized in accordance with SD NRCS CPS Stream Channel Stabilization (584).

Where rock is used for ford type stream crossings for livestock, use a hoof contact zone or alternative surfacing method over the surfacing rock.

Concrete Fords

Concrete fords must be designed under the direct supervision of an engineer. Concrete ford crossings shall be used only where the foundation of the stream crossing is determined to have adequate bearing strength.

Concrete shall have a minimum compressive strength of 3,000 psi at 28 days. Concrete ford crossings shall have a minimum thickness of placed concrete of five inches with minimum reinforcement of six-inch by six-inch, six-gauge welded wire fabric. The concrete slab shall be poured on a minimum four-inch thick rock base, unless the foundation is otherwise acceptable.

Precast concrete panels may be used in lieu of cast-in-place concrete slabs. Precast concrete units shall comply with ACI 525 or 533, or as otherwise acceptable for local conditions.

When heavy equipment loads are anticipated, the concrete slab shall be designed using an appropriate procedure as described in American Concrete Institute, ACI 360, Design of Slabs on Grade.

Geocell and/or Rock Ford Crossings

Rock ford crossings with geotextile shall be used when the site has a soft or unstable subgrade. Ford crossings made of stabilizing material such as rock riprap are often used in steep areas subject to flash flooding, where normal flow is shallow or intermittent.

The bed of the channel shall be excavated to the necessary depth and width and covered with geotextile material. The geotextile material shall be installed on the excavated surface of the ford and shall extend across the bottom of the stream and at least up to the 10-year, 24-hour peak discharge elevation.

The geotextile material shall be covered with at least six inches of crushed rock. If using geocells, the cells shall be at least six inches deep. All geosynthetic material shall be suitably durable and shall be installed in accordance with the manufacturer's recommendations, including the use of staples, clips, and anchor pins.

At minimum, all rock ford stream crossings shall be designed to remain stable during the 10-year, 24-hour peak discharge.

CONSIDERATIONS

Avoid or minimize stream crossings, when possible, through evaluation of alternative trail or travel-routes.

Ford crossings have the least detrimental impact on water quality when crossing use is infrequent. Ford crossings are adapted for crossing wide, shallow watercourses with stable streambeds.

Stream crossings should be located where adverse environmental impacts will be minimized. Consider the following:

Effects on upstream and downstream flow conditions that could result in increases in erosion, deposition, or flooding.

Effects on adjacent riparian areas, including potentials for overgrazing, erosion, and loss of habitat.

Short-term and construction related effects on water quality and water temperature.

Effects on endangered and threatened aquatic species, fish passage, and wildlife habitats.

Effects on scenic areas and cultural resources.

Overall effect on erosion and sedimentation that will be caused by the installation of the crossing and any necessary stream diversion.

Evaluate the need for safety measures such as guardrails or water depth signage at ford crossings.

PLANS AND SPECIFICATIONS

Plans and specifications for stream crossings shall be in keeping with this standard and shall describe the requirements for applying the

practice to achieve its intended purpose. Include the location and the kind, amount, and quality of materials to be used.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed for the use of the owner/operator and implemented for the life of the practice.

Specify inspection annually and after significant storm events to identify repair and maintenance needs. Include where appropriate:

Periodic grading or re-shaping to maintain grades and dimensions.

Periodic addition of surfacing materials where used.

Re-seed areas of damaged or destroyed vegetation.

Repair fences and gates.

Remove and manage manure accumulations.