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.

Low water fords are the preferred stream crossing to be constructed under this standard. Culverts should generally considered for small drainageways, where a ford crossing would result in undesirable access road slopes

CRITERIA

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. Avoid sites where channel grade or alignment changes abruptly, excessive seepage or instability is evident, overfalls exist, or large tributaries enter the stream. Wetland areas shall be avoided if at all possible.

Locate crossings, where possible, out of shady riparian areas to discourage cattle loafing time in 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. Where high rates of erosion of the adjacent roadways that slope towards the crossing threaten to deliver an excessive amount of sediment to the drainage, install measures to minimize erosion of the roadside ditch, road surface, and/or cut slopes. Where the stream crossing is installed as part of a roadway, the crossing shall be in accordance with NRCS Conservation Practice Standard, 560, Access Road.

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 6 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 2 horizontal to 1 vertical. Rock cuts or fills shall be no steeper than 1.5 horizontal to 1 vertical.

Stream Approaches. Approaches to the stream crossing shall blend with existing site conditions where possible, and shall not be steeper than 4 horizontal to 1 vertical. Unless the foundation geology is otherwise acceptable, 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.

Surface runoff shall be diverted around the approaches to prevent erosion of the approaches. Roadside ditches shall be directed into a diversion or away from the crossing surface.

Rock. All rock shall be chosen to withstand exposure to air, water, freezing and thawing. When rock is used, it shall be sufficiently large and dense so that it is not mobilized by design flood flows.

Fencing. Areas adjacent to the stream crossing shall be permanently fenced or otherwise excluded as needed to manage livestock access to the crossing.

Fencing shall not be placed across navigable streams

Cross-stream fencing at fords shall be accomplished with breakaway wire, swinging floodgates, hanging electrified chain or other devices to allow the passage of floodwater debris during high flows.

All fencing shall be designed and constructed in accordance with NRCS Conservation Practice Standard 382, Fence.

Vegetation. All areas to be vegetated shall be planted as soon as practical after construction. When necessary, use of NRCS Conservation Practice Standard 342, Critical Area Planting shall be considered where vegetation is unlikely to become established by natural regeneration, or acceleration of the recovery of vegetation is desired.

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. 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.

Cutoff walls shall be provided at the upstream and downstream edges of ford-type stream crossings when needed to protect against undercutting.

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 NRCS Conservation Practice Standard 584, Stream Channel Stabilization.

Rock Fords

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

Rock ford crossings with geotextile shall be used when the site has a soft or unstable subgrade. The need for bedding material or geotextile fabric underlayment between the base material and subgrade must be evaluated. Geotextile material must be designed and placed so it does not become exposed during channel flow or subjected to excessive hydraulic uplift. Where geotextile material is used, a keyway shall be designed the upstream end and is recommended on the downstream end of the crossing. Geotextile material shall not be placed in flowing water. Placement must occur when the streambed is dry, or the stream must be temporarily dammed & the flow diverted.

The geotextile material shall be covered with at least 6 inches of crushed rock. If using geocells, the cells shall be at least 6 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 crossings shall be designed to remain stable when the channel is flowing at the lesser of the 10-year, 24-hour peak discharge elevation or the top of bank. The design folder shall contain documentation showing design discharge, and how the size of the base material was selected.

The crossing base material will consist of crushed rock or riprap placed at the following minimum thickness:

- The minimum thickness of AASHTO # 1's when used as a crossing base, is 9 inches.
- The minimum thickness of ODOT 601 Type "D" riprap when used as a crossing base, is 12 inches

The crossing surface will consist of filling the voids of the base material with fines such as ODOT 304.02 or AASHTO # 57's as appropriate to make a suitable walking surface. Where high stream velocity could displace the fines, a smooth grouted riprap surface should be considered.

The crossing bottom width is not to exceed 10 feet when the crossing is only for livestock usage. If the crossing is also to be used by farm equipment the bottom width may be increased to 20 feet.

The entrance slope into the stream bottom is to be no steeper than 5 horizontal to 1 vertical. The crossing cut slopes into the channel banks are to be no steeper than 2 horizontal to 1 vertical.

Livestock will be prevented from migrating from the crossing into the stream by use of appropriate fencing or extending base material a minimum of 5 feet into the stream bottom both upstream and downstream of the crossing width. AASHTO # 1's is the minimum size needed to prevent cattle from migrating out of the crossing and into the channel. Planning and O&M needs must account for the potential that this rock can be clogged by sediment carried as stream bedload.

The finished top of crossing will not protrude above the natural stream bottom, unless the crossing is specifically designed as a rock sill to enhance aquatic habitat.

The preferred crossing alignment is perpendicular to the stream flow. Where the crossing alignment is skewed to the stream, the design folder will contain documentation that the planned alignment will not cause streambank erosion or sedimentation.

Crossings are to be placed where the existing stream bottom and banks are in a stable stream reach. The design folder will include documentation that the stream is stable a minimum of 100 feet upstream and downstream of the planned crossing location.

Crossings are not to be located where concentrated surface water flows enter the stream, or these flows need to be diverted to enter the stream downstream (preferred) or upstream of the crossing.

Concrete Fords

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 5 inches with minimum reinforcement of 6-inch by 6-inch, 6 gauge welded wire fabric. The concrete slab shall be poured on a minimum 4-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.

Criteria for Culvert and Bridge Crossings

Design of culverts and bridges shall be consistent with sound engineering principles and shall be adequate for the use, type of road, or class of vehicle. Culverts and bridges shall have sufficient capacity to convey the design flow without appreciably altering the stream flow characteristics.

These crossings will generally fall within Corps of Engineers, Nationwide 404 Permit 14. However, if the crossing is placed within a special aquatic site, such as wetlands or riffle & pool complexes, Corps of Engineers notification is required. The NRCS State Biologist is to be consulted during planning, where these conditions exist.

Acceptable bridge materials include concrete, steel, and wood.

Culvert Crossings

Culverts shall be sized to handle at least the bankfull flow or the peak runoff from the 2-year, 24-hour peak discharge, whichever is less. Crossings shall be adequately protected so that out-of-bank flows safely bypass without structure or streambank damage, or erosion of the crossing fill. Additional culverts may be used at various elevations to maintain terrace or floodplain hydraulics.

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. Crossing fill slopes shall not be steeper than 2 horizontal to 1 vertical.

The minimum top width of the crossing designed for one way travel is of 16 ft., or the outside tread width of the design travel equipment plus 5 feet.

An auxiliary spillway will be provided to protect the crossing from overtopping during bankfull channel flow. The auxiliary spillway will be a minimum of 1 ft. below the top of the roadway at the culvert location.

The minimum culvert diameter to be used in a stream crossing is 12 inches.

Acceptable culvert materials include concrete, corrugated metal, corrugated plastic, new or used high quality steel. Installation methods shall meet the criteria stated in Conservation Practice Standard 587, Structure for Water Control

Where culverts are placed in streams (except ephemeral streams) at least 10% of the culvert bottom shall be buried below the existing stream grade. Hydraulic capacity shall be based upon the remaining open area of the culvert.

CONSIDERATIONS

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

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

Stream crossings should be located where adverse environmental impacts will be minimized and considering the following:

- Effects on up-stream and down-stream flow conditions that could result in increases in erosion, deposition, or flooding.
- Short term and construction-related effects on water quality.
- Effects on fish passage and wildlife habitats.
- Effects on cultural resources.
- Overall effect on erosion and sedimentation that will be caused by the installation of the crossing and any necessary stream diversion.

Where stream crossings are used, evaluate the need for safety measures such as guardrails at culvert or bridge crossing, 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.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed and implemented for the life of the practice.

The stream crossing, appurtenances, and associated fence should be inspected after each major storm event, with repairs made as needed.