

Stream Crossing (No.) 578

DEFINITION

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

PURPOSES

- 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

General Criteria Applicable To All Purposes

Stream crossings shall be planned, designed, and installed to meet all federal, state, local, and tribal laws and regulations.

Investigate required federal, state, and local permits depending on the jurisdictional authority for the stream, county drain, or inter-county drain. Permits that may apply include, but are not limited to, the following:

1. Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, 1994, P.A. 451. Permits for development of livestock crossings if any of the following occurs:
 - A. Dredging or other disruption of stream bottom material;
 - B. Filling, including the placement of concrete, gravel, crushed stone, rock, or peastone;

- C. Sloping and shaping of the immediate streambank, and other land alteration within 500 feet of the stream;
- D. Construction of ponds within 500 feet of a lake or stream;
- E. Alteration of wetland areas;
- F. Disruption of flood flows; or
- G. Certain streams classified by state and federal governments as wild and scenic rivers may have additional restrictions.

2. Permit from the County Drain Commissioner, County Drain Board, or Inter-County Drainage Board if crossing is constructed along county drains.

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 *as well as* fish and other aquatic organisms within the channel during all seasons of the year. *Projects that may impact a threatened or endangered species require consultation with the U.S. Fish and Wildlife Service for Federally-listed species and the Michigan Department of Natural Resources for state-listed species. These agencies will further evaluate the threatened or endangered species impacts of the project and help determine if the project is feasible.*

Access Roads. Where high rates of erosion of the adjacent roadways that slope toward 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 Access Road (560).

Width. The stream crossing shall provide an adequate travel-way width for the intended use. A stream crossing used for vehicular traffic shall have a travel-way no less than 16 feet wide *and no more than 4 feet wider than the widest vehicle that will be using the crossing.* A stream crossing used

exclusively for livestock crossing shall be no less than 10 feet wide *and no more than 16 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.

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 Fence (382).

Refer to NRCS conservation practice standards: Use Exclusion (472), Prescribed Grazing (528A), Filter Strip (393A), Riparian Herbaceous Cover (390), Riparian Forest Buffer (391), or other practice standards to determine the location of the fence and for the management of the land between streambank and fence.

Vegetation. Seed and mulch all exposed disturbed areas according to NRCS conservation practice

standard Critical Area Planting (342). Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office Technical Guide, Section II, Invasive Plant Species for plant materials identified as invasive species.

Additional Criteria Applicable to Culvert and Bridge Crossings

Design of culverts and bridges shall be in accordance with NRCS conservation practice standard Access Road (560).

Additional Criteria Applicable to Ford-Type Crossings

Ford-type stream crossings shall have a stable surface. The surface may either be coarse aggregate or concrete.

Ford-type stream crossings shall be placed over firm, native mineral soil material where the foundation of the stream crossing is determined to have adequate bearing strength. Ford-type stream crossings may not be placed on organic soils unless suitable base, designed in accordance with a foundation analysis, is provided to support the anticipated animal or vehicular traffic loads.

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.

The finished top surface of the ford-type stream crossing in the bottom of the watercourse shall be no higher than the lowest stable elevation of the channel crossing section at the upstream edge of the ford crossing.

Ramp slope shall be 6H:1V or flatter for livestock only ford-type stream crossings. Ramp slope shall be 8H:1V or flatter for ford-type stream crossings intended for vehicles.

Concrete Surface. Concrete surfaced crossings shall be designed to support the anticipated animal or vehicular loads. Cast-in-place concrete shall be a minimum 5-inch thick. No joints, wire mesh, or fiber reinforcement are required for cast-in-place concrete slabs. Concrete shall be placed over a minimum 4-inch thick layer of compacted sand. The concrete surface shall be roughened to provide a non-skid surface. Concrete shall comply with the guidance in the current Construction Specification, NRCS-MI-159, *Plain Concrete*. 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*.

Coarse Aggregate Surface. Coarse aggregate crossings and livestock watering access facilities shall be underlaid by *non-woven geotextile designated for Stream Crossing & Surface Water Livestock Access Watering Facility* in accordance with Construction Specification, NRCS-MI-165, *Geotextiles*. Coarse aggregate shall be natural stone, crushed rock, or gravel. Where velocity based on flow depth at top of low bank is 3.5 feet per second or less, the coarse aggregate material shall have a minimum D_{100} size of 1.5 inch with less than 5 percent passing the number 200 sieve. Where the velocity based on flow depth at top of low bank exceeds 3.5 feet per second, the size of the coarse aggregate material shall be determined by a site-specific design or alternative stabilizing or surfacing measures such as geocells shall be employed. Where traffic may displace loose aggregate, alternative measures shall be implemented.

Address livestock comfort, as appropriate, when selecting coarse aggregate or alternative surfacing measures. *The selected coarse aggregate or alternative surfacing measures shall accommodate access while discouraging the livestock from lingering in the stream crossing.*

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 or to the top of the bank, whichever is lower.

The geotextile material shall be covered with at least 12 inches of *coarse aggregate*. 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 *coarse aggregate* ford stream crossings shall be designed to remain stable during the 10-year, 24-hour peak discharge.

CONSIDERATIONS

Consider the potential effects of installation and operation of stream crossings on the cultural, archeological, historic, and economic resources.

Where feasible and practical, minimize or avoid stream crossings through evaluation of alternative trail or travel-way locations.

Ford-type 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.

Consider cutoff walls at the upstream and downstream edges of ford-type stream crossings when needed to protect against undercutting.

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

Consider effects on *aquatic organism* passage and wildlife habitats.

Consider the need for safety measures such as guardrails at culvert and bridge crossings or water depth signage at ford crossings.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
 - Assistance notes or special report
- Survey notes, where applicable
 - Design survey

- Construction layout survey
- Construction check survey
- Design records
 - Physical data, functional requirements, and site constraints, where applicable
 - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
 - Location map
 - “Designed by” and “Checked by” names or initials
 - Approval signature
 - Job class designation
 - Initials from preconstruction conference
 - As-built notes
- Construction inspection records
 - Assistance notes or separate inspection records
 - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.