

**NATURAL RESOURCES CONSERVATION SERVICE**  
**MISSOURI CONSTRUCTION SPECIFICATION**  
**STREAM CROSSING**

**ROCK RIPRAP LINED**

**CODE 578**  
**578-A**

**GENERAL**

Construction operations shall be carried out in a manner and sequence that erosion and air and water pollution are minimized and held within legal limits. **A land disturbance permit from the Missouri Department of Natural Resources may be needed if the disturbed area is greater than one (1) acre in size.**

Project may require a federal permit under Section 404 of the Clean Water Act. Contact the U.S. Army Corps of Engineers Regulatory Office for information.

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used.

The contractor is responsible for having all utilities located at the site according to Missouri state laws prior to beginning work.

**MATERIALS**

Individual rock fragments shall be dense, sound, and free from defects conducive to accelerated weathering. Sandstone and siltstone shall not be used. Rock fragments shall be angular to sub rounded in shape. The rock should have the following properties:

- a. Bulk specific gravity (saturated surface-dry basis) not less than 2.5 .
- b. Absorption not more than 2 percent.
- c. Soundness: Weight loss in 5 cycles not more than 20 percent when sodium sulphate is used or 25 percent when magnesium sulfate is used.

The rock shall conform to the specified grading limits. Flat slabs of concrete or rock shall not be used.

Geotextile conforming to Missouri Construction Specification 753 Geotextile shall be used when shown on the drawings.

**SUBGRADE PREPARATION**

Foundation area shall be cleared of trees, stumps, roots, and sod. Cross section area shall be excavated to the neat lines and grades as shown on the drawings. Over excavated areas shall be backfilled with moist soil compacted to the density of the surrounding material. Spoil material shall be placed in the locations shown on the drawings.

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**EQUIPMENT-PLACED ROCK RIPRAP**

Rock shall be placed by equipment on the surfaces and to the depths specified. Riprap shall be placed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials.

Riprap in place shall be reasonably homogeneous with larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spoils filling the voids between the larger rocks. Riprap shall be placed so it does not reduce the channel cross sectional area. It is recommended that rock placement begin at the channel bottom section and progress towards each bank.

**FILTER OR BEDDING LAYER**

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. The surface of such layers shall be finished reasonably free of mounds, dips, or windrows. The filter or bedding materials shall be hard, durable material conforming to the grading limits shown on the drawings or in the specifications.

**SITE PREPARATION**

All trees, stumps, brush, and similar materials are to be removed from the construction area and disposed of in a manner consistent with environmental concerns and proper functioning of the structure. Topsoil shall be conserved if needed.

**FINISH AND CLEANUP**

The disturbed area and the designated spoil areas will be finished in a relatively smooth condition ready for seeding. All rocks 3 inches in diameter or larger and roots shall be removed from the surface areas prior to seeding.

**VEGETATION**

Refer to JS-AGRON-25 for seeding and mulching recommendations or equivalent.

**Additional Details:** \_\_\_\_\_  
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**NATURAL RESOURCES CONSERVATION SERVICE**  
**MISSOURI CONSTRUCTION SPECIFICATION**  
**STREAM CROSSING**

**CONCRETE LINED**

**CODE 578**  
**578-B**

**GENERAL**

Construction operations shall be carried out in a manner and sequence that erosion and air and water pollution are minimized and held within legal limits. **A land disturbance permit from the Missouri Department of Natural Resources may be needed if the disturbed area is greater than one (1) acre in size.**

Project may require a federal permit under Section 404 of the Clean Water Act. Contact the U.S. Army Corps of Engineers Regulatory Office for information.

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used.

The contractor is responsible for having all utilities located at the site according to Missouri state laws prior to beginning work.

**MATERIALS**

Materials and fabrication shall be as specified herein or on the drawings.

Concrete and reinforcement steel shall conform to Missouri Construction Specification 750, Reinforced Concrete.

Geotextile conforming to Missouri Construction Specification 753 Geotextile shall be used when shown on the drawings.

**EXCAVATION, FILL, BACKFILL, AND FINISH GRADING**

Foundation area shall be cleared of trees, stumps, roots, sod, and loose rock.

Cross section area shall be excavated to the neat lines and grades as shown on the drawings. Over excavated areas shall be backfilled with moist soil compacted to the density of the surrounding material.

Suitable excavated material may be used as fill and backfill. Spoil material shall be placed in the locations shown on the drawings.

Finish grading shall consist of smoothing and grading to form a smooth uniform surface between the existing ground and the top of the concrete lining. When completed the entire disturbed area shall be ready for seeding.

**CONSTRUCTION**

Concrete lining shall be placed to the thickness, shapes, lines, and grades shown on the drawings. Abrupt deviations from line or grade shall not be permitted. Except for sections of the

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crossing designed with steel reinforcement that are to be poured in one contiguous unit, the lining shall be formed and placed in alternate sections, not to exceed fifteen (15) feet. Expansion joint filler shall be placed between each section.

Steel reinforcement will be placed at locations shown on the drawings, if applicable.

Earth surface shall be firm and damp where concrete is to be placed.

Placement and curing of concrete shall conform to Missouri Construction Specification 750, Reinforced Concrete.

**VEGETATION**

Refer to JS-AGRON-25 for seeding and mulching recommendations or equivalent.

***Additional Details:*** \_\_\_\_\_  
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**NATURAL RESOURCES CONSERVATION SERVICE**  
**MISSOURI OPERATION AND MAINTENANCE**  
**STREAM CROSSING**  
**CODE 578**

**GENERAL**

Operation and maintenance shall address maintaining the lined portions, associated berms approaches. Site should be checked every six months and after any excessive rainfall.

Any component at the site should be corrected as soon as possible to prevent major damages.

**STREAM CROSSING APPROACHES**

Eroded areas shall be promptly repaired and reseeded, if applicable.

Diversion berms if installed shall be maintained at the design height shown on the as-built drawings.

**TYPE OF LINING**

**Concrete**

Check for any cracking in concrete surface and determine to what depth the cracking is occurring.

Look for any exposed steel reinforcement, if applicable. If present and exposed, prepare a neat cement mixture composed of cement, sand, and water. Prepare area to be patched by chipping back to solid material, wetting the area by placing wet burlap or other moisture holding materials on the area for at least one hour prior to start of patching.

Observe the condition of any contraction joints. Consult with local office staff on ways to repair effected area.

**Rock Riprap**

Compare size of existing rock pieces to size of those at time of installation. (Refer to as-built drawings and specifications.) If substantially smaller in size, consider replacing rock riprap with proper size in order for crossing to operate as designed.

Check for overall appearance of cross sectional area. Redistribute rock pieces to reestablish proper cross sectional shape and dimensions. Add additional rock riprap as needed to maintain the designed cross-section.

**Geocell**

Check for eroded areas within the cell matrix and repair by filling with the proper sized rock (Refer to as-built drawings and specifications).

**VEGETATION**

The vegetation shall be maintained to prevent erosion or gulying of the associated berm and other areas near the stream crossing site.

**Additional Details:** \_\_\_\_\_