

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATIONS**

STREAM CROSSING

(No.)

CODE 578

SCOPE

These construction specifications cover the materials and installation of stream crossings, as shown on the plans or as stake in the field.

PUBLIC AND PRIVATE UTILITIES

Utilities are defined to be public or private, overhead and underground power or communication lines, and any pipelines. The landowner/operator/contractor shall conduct their own search and discovery for utilities in order to lessen or avoid potential damages, injuries or loss of life. Prior to construction, the owner/operator should complete an OK-ENG-45 UTILITIES INVENTORY & CONSTRUCTION RELEASE FORM to document known utilities in order to comply with State law prior to any ground disturbance and return it to a USDA-NRCS representative.

QUALITY CONTROL

Quality Control of all materials and construction procedures is the responsibility of the landowner and contractor. NRCS will make periodic review(s) of the work for the benefit of the agency which will include the final construction check.

MATERIALS

All materials shall conform to appropriate ASTM specifications.

Hoof Contact Material. Gradation of surfacing riprap for livestock hoof interface is as shown in the following table. If such riprap is smaller than needed for design conditions, the surfacing material will need regular replacement and maintenance, or other design solutions should be sought.

Size of Rock for Livestock Hoof Interface (inches)	% Smaller by Weight
3	100
2-1/2	90-100
2	35-70
1-1/2	0-15
3/4	0-5

Rock. All rock must be able to withstand exposure to air, water, freezing, and thawing. Individual rock fragments shall be dense, sound and free from cracks, seams, and other defects conducive to accelerated weathering. Only angular to subrounded rock shall be used. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment.

The source of rock for riprap must be approved by the Government and material shall meet or exceed the criteria of NRCS Rock Type 3, which are detailed below:

- Bulk specific gravity (saturated surface-dry basis)—Not less than 2.3 when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.

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- Absorption—Not more than 4 percent when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing. NRCS-OKLA 263E-2 June 2010
- Soundness—The weight loss in 5 cycles shall be not less than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used.

In lieu of the above criteria, rock sources which possess a current Oklahoma Department of Transportation Stone for Riprap certification may be accepted.

Geotextile. The geotextile shall be a Class I nonwoven geotextile fabric with a minimum weight of 8 ounces per square yard. The fabric shall also meet the following requirements:

Property	Test Method	Requirement
Tensile Strength	ASTM D4632	180 lb. - min.
Elongation at Failure	ASTM D4632	≥ 50%
Puncture	ASTM D4833	80 lb. - min.
Ultraviolet Light (% residual tensile strength)	ASTM D4355	70 % - min.
Apparent Opening Size (AOS)	ASTM D4751	#40 sieve - max.
Permittivity	ASTM D4491	0.70/sec - min.

Geocells. The geocells shall be an approved plastic (PE) three-dimensional cellular containment grid and a minimum of 6-inches deep.

Plastic Components. High Density Polyethylene (HDPE) tubing with smooth interior and corrugated exterior is an acceptable culvert type. Other plastic materials shall be approved by the engineer for the appropriate design conditions.

Corrugated polyethylene tubing shall conform to the following requirements for the nominal diameters listed:

- ASTM F 405 for diameters 3 to 6 inches
- ASTM F 667 for diameters 8 to 24 inches
- ASTM F 894 for diameters 18 to 120 inches
- AASHTO M 252 for diameters of 3 to 10 inches
- AASHTO M 294 for diameters of 12 to 36 inches

Metal Components. Metal culverts shall be either new or used high quality welded steel, new steel corrugated metal pipe (CMP), new corrugated aluminum pipe, or other materials approved by the engineer for the appropriate design conditions. When CMP is used for culverts, all welded seams shall be wire brushed and painted with two coats of zinc dust-zinc oxide primer or equivalent material.

Unless otherwise specified, CMP culverts shall be helically corrugated and all connectors shall be flanged couplers, Hugger type or equivalent couplers, or annular corrugated band couplers. When the Hugger type or annular corrugated band couplers are to be used, the pipe ends shall be reformed with annular corrugations. Hugger-type couplers shall be installed with o-ring gasket seals, and 18-inch and larger diameter pipe shall have one encircling rod on each side of the joint. Annular corrugated band couplers shall be 12-inch wide bands installed with o-ring or neoprene gasket seal and two encircling rods on each side of the joints. O-ring gaskets for Hugger type couplers shall be 13/16-inch diameter for less than 42-inch diameter pipe and 7/8-inch diameter for 42-inch and larger pipe. O-ring gaskets for annular corrugated couplers shall be 3/8-inch diameter and shall be fabricated from a high-grade rubber compound. They shall be homogeneous, free of blisters, pitting or other imperfections.

Neoprene gaskets for annular corrugated couplers shall have a minimum width of 6 inches and a minimum thickness of 3/8 inch.

Aluminized or polymer coatings may be specified in certain circumstances for added protection of the steel structures. If specified, aluminized pipe shall be Aluminum-Coated Type 2 and meet ASTM A-819. Polymer coatings shall be a minimum of 0.01 inches thick (10 mil) and meet ASTM A-762.

Welded steel may be used material so long as it is sound pipe without damaging corrosion pits, does not exceed 36-inch diameter, and has wall thickness equal to or greater than the specified minimum in the standard.

Concrete. All concrete is to consist of a workable mix that can be placed and finished in an acceptable manner. The mix design and testing of concrete shall be consistent with the size and requirements for the job. Concrete shall be placed to the lines and grades as shown on the plans or as staked in the field.

The type of cement, air entrainment, slump, aggregate, or other properties shall be specified as necessary. Use concrete with a minimum compressive strength of 3,000 psi at 28 days, with a ratio of water to cementitious materials of 0.50 or less. Use coarse aggregate of 0.75 to 1 inch nominal size.

The concrete shall be delivered to the site and discharged into the forms within 1-1/2 hours after the introduction of the cement to the aggregates, unless a mix design with set retarder is approved for use by the technician. If needed, reinforcing steel shall be placed as indicated on the plans and shall be held securely in place during concrete placement.

Precast concrete units shall comply with ACI 525 or 533, or as otherwise acceptable for local conditions.

Fiber Reinforced Concrete. Fibrillated polypropylene fibers of 3/4 inch to 1 1/2 inch in length shall be used at a minimum rate of 1.5 pounds per cubic yard of concrete. Concrete mix design shall produce 3000-psi concrete in 28 days. Use only approved 7-day concrete cure.

Additional water will not be added to the job mix. Only superplasticizers or low range water reducers as recommended by the concrete plant shall be added.

FOUNDATION PREPARATION

The foundation area shall be cleared of trees, logs, stumps, roots, brush, boulders, sod, and other objectionable materials.

The complete work shall conform to the lines, grades, and elevations shown on the drawings. The cross-section shall be excavated to the neat lines and grades shown on the plans. No abrupt deviations from design grade or horizontal alignment shall be permitted.

The topsoil and sod shall be stockpiled during construction and reinstalled upon project completion. All disturbed areas shall be vegetated or otherwise provided with a cover to protect the areas against soil erosion.

Stream crossings shall be located to minimize excavation. Excavation will be required to allow for the placement of rock or other materials to the grades shown on the plans.

Plastic and Metal Culverts. If the culvert has at least 2 feet of compacted fill beneath the culvert, a minimum of 6 inches with a maximum of 8 inches below the grade line of the culvert shall be pulverized for a width of 2 culvert diameters.

If the culvert has less than 2 feet of compacted fill beneath the culvert or less than 2 feet of excavation as measured from natural ground to grade line of the culvert, the area beneath the culvert shall be excavated a minimum width of 2 culvert diameters to a depth of 2 feet below gradeline of the culvert

and replaced with compacted fill. A minimum of 6 inches with a maximum of 8 inches below the gradeline of the culvert shall be pulverized for a width of 2 culvert diameters.

If the culvert has at least 2 feet of excavation as measured from natural groundline to gradeline of the culvert, a minimum of 6 inches with a maximum of 8 inches below the gradeline of the culvert shall be pulverized for a width of 2 culvert diameters.

INSTALLATION

Rock. Rock may be placed by equipment or by hand. Placement must ensure that rocks are reasonably homogeneous with larger rocks uniformly distributed and in firm contact with one another and smaller rocks filling in the voids.

Geotextile. Dewater and excavate the bed of the channel to the necessary depth and width, as shown on the plans or as staked in the field. Prior to placement of the geotextile, the soil surface shall be prepared reasonably smooth and free of loose rocks, holes, projections, mud or standing water. The geotextile shall not be placed until it can be properly anchored and covered within 48 hours.

Install the geotextile material on the excavated surface of the stream crossing as shown on the plans or as staked in the field. Installation shall be in accordance with the manufacturer's recommendations, including the use of staples, clips, and anchor pins. Geotextile shall be placed with the length perpendicular to the direction of flow. All laps shall be a minimum of 18 inches and installed with the upper perpendicular length overlapping the lower adjoining segment. Geotextile shall be pinned as recommended by the manufacturer.

In no case shall material be dropped onto an uncovered geotextile from a height greater than 3 feet.

Geocell. Installation shall be in accordance with the manufacturer's recommendations, including the use of staples, clips, and anchor pins.

Plastic and Metal Culverts. After the culvert is seated into the pulverized bed, the bed shall be watered until it is thoroughly wetted. Fill within 2 feet of culvert (except the foundation) shall contain no particles larger than 1/4 inch and shall be hand compacted or compacted with manually directed power tampers.

Fill within 3 inches of the culvert shall be placed at a moisture content which permits ease of compaction around the culvert and into the corrugations of corrugated culverts. Each layer of the portion of fill that is within 3 inches of the culvert shall be thoroughly rodded or tamped around the culvert and into each corrugation by hand using a tamping bar.

Fill outside the 3-inch limits but within the 2-foot limits described above shall be at the moisture content specified for the remainder of the fill and shall be compacted to a density equal to the remainder of the fill.

Concrete. Dewatering of the site and toe-walls is required during placement of the concrete to maintain the proper water/cement ratio. Flowing water will erode concrete that is not sufficiently hardened. The stream must be diverted or retained from flowing over the concrete for at least 12 hours after placement of the concrete.

During construction, aquatic species must be removed from the construction area according to State protocols.

Subgrades and forms shall be installed to line and grade, and the forms shall be mortar tight and unyielding as the concrete is placed. The concrete shall be consolidated in the forms as it is placed to

insure a tight bond to reinforcing steel and to yield a dense concrete. Concrete shall not be placed when the outside temperature is below 40 degrees or above 90 degrees Fahrenheit.

Concrete placed during cold weather shall be protected from freezing during the curing period. The concrete shall be cured by covering it with burlap, canvas, or other suitable material and kept from drying out for at least 7 days. The concrete may be cured by coating the surface with an approved white-pigmented curing compound.

Slabs shall have a broomed or other non-slip finish.

Fiber Reinforced Concrete. Contraction joints shall be installed each 12 feet for 4-inch thick slabs or each 15 feet for 5-inch thick slabs.

Do not use tined (garden) rakes to move or place FRC as the tines disrupt the three-dimensional fibrous distribution.

Wait until all surface water has disappeared from the concrete surface before finishing. Use steel or magnesium trowels or floats. Wood floats may not be used. When hand troweling, trowel only in one direction so that the surface fibers are not raised up.

POLLUTION CONTROL AND PROJECT COMPLETION

Construction operations shall be carried out so that erosion and air and water pollution are minimized and held within reasonable and legal limits. All work shall be conducted in a skillful and workmanlike manner. The completed job shall present a workmanlike appearance.

Measures and construction methods that enhance fish and wildlife values shall be incorporated as needed and practical. Fencing and cover to control erosion and pollution shall be established as needed. Appropriate safety measures, such as warning signs, rescue facilities, and fencing, shall be provided as needed.