

**NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION**

REINFORCED CONCRETE

CODE 750

SCOPE

This specification covers concrete construction for conservation practices. Work shall consist of furnishing all labor, equipment and materials needed to construct the concrete structure as shown on the drawings. The completed job shall be workmanlike and present a good appearance.

MATERIAL SPECIFICATIONS AND DEFINITIONS

All materials used in concrete construction shall meet the applicable ASTM standards and/or American Concrete Institute (ACI) specifications.

Admixtures for Concrete are those ingredients in concrete other than Portland Cement, water, and aggregates that are added to the mixture immediately before mixing, during mixing, or placement.

Aggregates shall consist of a uniform graded mixture of sand and gravel (or crushed stone) that complies with ASTM C 33 Standard Specification for Concrete Aggregates.

Fly Ash shall conform to ASTM C 618 Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete or other standard as approved by NRCS engineer.

Ground Granulated Blast-Furnace Slag shall conform to ASTM C 989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars. Only grades 100 and 120 ground granulated blast-furnace slag or Portland Cement Type IS, which is interground or mixed with Portland Cement, are acceptable.

Laitance an accumulation of fine particles on the surface of fresh concrete due to the upward movement of water (as when excessive mixing water is used).

Portland Cement shall conform to ASTM C 150 Standard Specifications for Portland Cement or otherwise approved by NRCS engineer.

Reinforcement Steel shall be deformed bars that comply with ASTM A 615/ A615M Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement grade 40 or 60 as specified on the plans. Soft metric designation (ASTM A 615M) is explained in CRSI Engineering Data Report #42 Soft Metric Reinforcing Bars.

Water used in mixing concrete should be fresh potable water.

DESIGN OF THE CONCRETE MIX

The contractor shall be responsible for the design of the concrete mix and for providing documentation certifying that the concrete mix (with admixtures if used) will provide the required compressive strength. The documentation shall be provided to the landowner with copies to the NRCS engineer or representative. The proportions of the aggregate shall be such as to produce a concrete mixture that will work readily into the corners and angles of the forms and around reinforcement steel but will not segregate or exude free water during consolidation.

The concrete mix shall have a minimum 28-day compressive strength of 3,500 psi unless otherwise specified on the drawings or ADDITIONAL DETAILS section of this specification. A portion of

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Portland Cement may be replaced with cementitious or pozzolanic material. Only one material, fly ash or ground granulated blast-furnace slag, may be substituted for Portland Cement without prior approval of NRCS engineer. Fly ash may be used as a partial substitution for Portland Cement in an amount not greater than 25% (by weight) of the total cement in the concrete mix, unless otherwise specified. Ground granulated blast-furnace slag may be used as a partial substitution for Portland Cement in an amount not greater than 50% (by weight) of the total cement in the concrete mix, unless otherwise specified.

The water-cement ratio (w/c) shall not exceed 0.50, unless otherwise specified. Entrained air (air entraining admixture) must be used in all concrete that will be exposed to freezing and thawing. The air content by volume shall not be less than 5 percent or more than 8 percent.

Unless otherwise approved by the NRCS engineer or their representative, the maximum slump of the concrete mix shall be 5 inches.

When approved by the NRCS engineer or representative prior to placement of the concrete, a plasticizing admixture conforming to the requirements of ASTM C1017, Type 1 or Type 2 may be used to increase the slump of the concrete. The maximum slump after addition of the plasticizing admixture shall be 7½ inches, unless otherwise approved by the NRCS or representative. If the admixture is added at the batch plant, the concrete mix shall retain the increased slump for not less than 90 minutes after it is added. If the admixture is added at the job site, the concrete mix shall retain the higher slump for not less than 30 minutes after it is added. If the plasticizing admixture is added at the job site, the slump of the concrete mix prior to addition of the admixture shall not exceed 5 inches, unless otherwise approved by the NRCS engineer or representative. The plasticizing admixture shall be used according to the manufacturer's specifications.

BATCH TICKET INFORMATION

The contractor shall be responsible for any changes to the design mix.

The delivery ticket for each batch of concrete shall have the following minimum information and any additional information requested by the NRCS engineer:

- a. Date of delivery.
- b. Amount of concrete mix.
- c. Time the mixer truck is loaded.
- d. Design mix designation.
- e. Admixture(s) - Type and Quantity.
- f. Quantity of cement, fine and coarse aggregate on truck, unless listed with mix designation.
- g. Quantity of water added at plant. Include water adjustment for aggregate moisture content.

Post Delivery - The batch ticket should include the following information on placement:

- a. Quantity of water added by the receiver of the concrete.
- b. Admixture(s) added on site –Type, Quantity, and Time admixture added to the concrete.
- c. Time the concrete unloading was completed.

Upon completion of the placement, copies of all batch tickets shall be provided to the landowner.

REINFORCEMENT

Reinforcing steel shall be deformed bars manufactured specifically for concrete reinforcement and shall be a minimum of Grade 40 (40 ksi) unless otherwise specified on the drawings or ADDITIONAL

DETAILS section of this specification. Reinforcing steel shall be free from loose rust, concrete, oil, grease, paint or other deleterious coatings.

All reinforcing steel shall be cold-bent, if bends are required. Welding of reinforcing steel is not permitted.

Bar splices shall overlap a minimum of 30 bar diameters, or as specified on the drawings.

Concrete cast against a formed surface or leveled prepared sand or gravel shall have 2 inches concrete cover over steel reinforcement. Concrete cast against unprepared bare earth shall have a minimum of 3 inches concrete cover over steel reinforcement.

Steel placement shall be inspected by NRCS representative prior to each concrete pour.

Neither welded wire reinforcement nor synthetic or chopped fibers may be substituted for primary structural steel reinforcement.

FORMS AND STEEL PLACEMENT

Forms shall be of wood, plywood, steel, or other approved materials and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so the finished concrete will conform to the specified dimensions and contours.

Forms shall be coated with a nonstaining form release agent prior to being set in place. (Do not set forms then apply form release agent if it could come into contact with reinforcing steel.) Excess release agent, oil or other harmful substance shall be removed prior to setting forms in place.

Items to be embedded in the concrete shall be positioned accurately and anchored securely.

CONVEYING AND PLACING

Concrete shall not be placed until the subgrade, forms, and steel reinforcement have been inspected and approved by the NRCS representative. Notice shall be given to the NRCS representative 24 hours prior to the time of concrete placement.

Rock surfaces shall be cleaned and wetted prior to placement of concrete. All other subgrade surfaces shall be firm and damp prior to placement of concrete. Placement of concrete on mud, dried earth, uncompacted fill, or frozen subgrade will not be permitted.

Concrete shall be placed within 1 ½ hours after the introduction of the water to the cement and aggregate.

Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods that will prevent segregation of the aggregates or loss of mortar. The concrete shall be deposited as closely as possible to its final position in the forms, and shall be worked into the corners and angles of the forms, and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance.

Slab concrete shall be placed to design thickness in one continuous layer. When the vertical drop is in excess of 5 feet hoppers, chutes, concrete pumps, or pipes shall be used to prevent segregation of the aggregate.

CONSTRUCTION JOINTS

Construction joints are placed in a slab where concreting operations are concluded for the day, generally in conformity with a predetermined joint layout. If at any time concreting is interrupted long enough for the placed concrete to harden, a construction joint must be used.

Construction joints on unformed surfaces shall have a rough surface.

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Construction joints shall moist cure for a minimum of 12 hours before the adjoining concrete is placed.

Surfaces of all construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, or debris by washing and scrubbing with a wire brush or wire broom or by other means approved by the NRCS representative.

WATERSTOPS

Waterstops shall be held firmly in the correct position as the concrete is placed. Joints in metal waterstops shall be soldered, brazed, or welded. Joints in rubber or plastic waterstops shall be cemented, welded, or vulcanized as recommended by the manufacturer. Wall pours shall not be continuous through waterstops. Vertical waterstops shall be held firmly in place by a bulkhead attached to the wall forms.

REMOVAL OF FORMS

Forms for walls and columns shall remain tight and in place for a minimum of 24 hours after placing the concrete. Forms for slabs shall not be loosened or removed for a minimum of 12 hours after placing concrete.

Forms, which support beams or covers, shall not be removed for at least 7 days, or as otherwise stated on the drawings. Forms for beams or covers, which are to support additional forms or shoring, shall not be removed for at least 14 days.

Removal of forms shall be done in a manner that will not damage the concrete surface nor induce sudden or excessive stresses.

CONCRETE REPAIR

Concrete that is honeycombed, damaged or otherwise defective shall be repaired or removed and replaced.

The NRCS engineer or representative will determine the required extent of removal, replacement or repair. The plan for effecting the repair must be approved by the NRCS representative prior to the beginning of the repair work.

CURING

Concrete shall be prevented from drying for a curing period of at least 5 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. The following can be used: sprinkling, flooding, fog spraying to maintain moisture; covering with continuously moistened canvas, cloth mats, straw, curing compound, plastic sheeting, impervious paper, or other approved materials; to minimize evaporation from concrete surface.

Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete, such as construction joints, shear plates, reinforcing steel and other embedded items.

Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

BACKFILLING NEW CONCRETE WALLS

Placement and compaction of fill adjacent to new concrete walls shall not begin less than 7 days after placement of concrete.

Provide compaction within 3 feet of the wall by means of hand tamping or small, manually directed equipment.

CONCRETING IN COLD WEATHER

Cold weather concreting procedures shall be used for all concrete mixed and placed between November 1 and April 1 regardless of weather forecasts.

Cold weather concreting procedures may be required before November 1 and after April 1 when the air temperature is less than 40° F at the time of placement or predicted to fall below 32° F in the following 24 hours.

The contractor shall submit a written plan detailing cold weather procedures. The procedures shall include how the concrete is going to be protected from falling below 32° F for 3 days. The written plan shall be approved by the NRCS engineer or representative, prior to any concrete work on the project.

Mix design for cold weather can include Type III cement (high early strength), increased cement content, or admixtures approved by NRCS representative. The use of antifreeze compounds (such as calcium chloride) will not be allowed.

In the event that there is no plan for cold weather provisions, concrete placement will not be permitted.

CONCRETING IN HOT WEATHER

When conditions are such that the air temperature may reasonably be expected to exceed 90° F at the time of delivery, during the placement operations or during the following 24 hours the following provisions shall apply:

- a. The contractor shall submit a written plan detailing procedures of mixing, placing, protection, curing and temperature monitoring during hot weather. The NRCS engineer or representative shall approve the written plan prior to the ordering of the concrete.
- b. Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or other means to maintain adequate moisture during the time between placement and finishing. Water shall not be added directly to the surface of the concrete in quantities that cause ponding prior to finishing.

Mix design for hot weather can include admixtures approved by NRCS representative.

In the event that there is no plan for hot weather provisions, concrete placement will not be permitted.

Additional Details: _____
