

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION
North Dakota

CONCRETE FOR MINOR STRUCTURES
(Code 102)

1. SCOPE

This specification is for volumetric batching of concrete and shall only be used for small, non-critical structures, generally less than 5 cubic yards in size and at the discretion of the designer. Typical installations may include thrust blocks, post/pole backfill, or small pads for livestock waterers.

Work shall consist of furnishing and placing steel reinforcement (if specified), placing, finishing, and curing concrete as shown on the drawings and in accordance with this specification. Any materials or construction details contained within the design package supersede those of this construction specification.

2. LOCATION

Concrete and accompanying reinforcing steel shall be installed at the locations, and in the configurations, as shown on the drawings and staked in the field. Any deviation from the drawings requires approval from NRCS prior to installation.

3. QUALITY CONTROL

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

4. MATERIALS

Steel – Steel reinforcement shall be commercial reinforcing steel specifically manufactured for use as concrete reinforcement. Deformed bars or wire mesh shall be at least the minimum size specified on the drawings. All reinforcement shall be free from flaking rust, oil, grease, paint, or other deleterious matter.

Portland Cement – Unless otherwise specified, the Portland cement shall be type IA or type IIA (air-entrained Portland cement) in conformance with ASTM C150 for the type of cement specified.

Aggregates – Concrete aggregates shall conform to the requirements of ASTM C33. Where aggregates conforming to these specifications are not obtainable, aggregates that have been shown by tests or by actual service to produce concrete of the required strength, durability, water tightness, and wearing qualities may be used if authorized by the NRCS.

Water – Water used in mixing shall be reasonably clean, free from objectionable quantities of sediment, organic matter, salts, or other impurities.

Air – If air entrainment is specified, the air content by volume shall be 5-7% of the volume of the concrete for maximum aggregate sizes of 3/8-in to 1-in or 4-6% for maximum aggregate sizes larger than 1-inch.

5. PLACING STEEL REINFORCEMENT

Bar bends shall be made without heating. The length of splices of reinforcing bars shall be as shown on the drawings. When not shown on the drawings, the length of splices shall provide an overlap equal to at least 36 times the diameter of the smaller bar spliced, but not less than 12 inches. Welded wire fabric shall be spliced by lapping not less than 6 inches with the lapped ends being securely clipped or wired together with wire ties or standard clips placed at intervals of 18 inches.

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. Holding steel reinforcement in position with temporary supports, tack welding of bars, and the direct driving of the reinforcement into the ground is not permitted.

Metal chairs, metal hangers, metal spacers, plastic chairs, or precast concrete chairs or blocks shall be used to support the reinforcement. Reinforcement shall not deflect or sag between supports. Metal

hangers, spacers and ties shall be placed in such a manner that they will not be exposed in the finished concrete surface.

Precast concrete chairs shall be manufactured of the same class of concrete as that specified for the structure and shall have tie wires securely anchored in the chair or a V-shaped groove at least 3/4-inch in depth molded into the upper surface to receive the steel bar at the point of support. Precast concrete chairs shall be clean and moist at the time concrete is placed.

Before reinforcement is placed, the surfaces of the bars and fabric and any metal supports shall be cleaned to remove any loose, flaky rust, mill scale, oil, grease or other coatings or foreign substances. After placement, the reinforcement shall be maintained in a clean condition until it is completely embedded in the concrete. On structures exceeding 2 cubic yards in concrete volume, the subgrade and placement of the reinforcing material shall be inspected by NRCS prior to placing the concrete.

6. PROPORTIONING THE CONCRETE MIX

The proportioning of cement, sand and gravel, and water should be such as to produce a workable concrete mixture (neither too sandy nor too harsh), with no more water in the mixture than is necessary to create the required degree of plasticity for proper handling and consolidation. A proper mix will work readily into the corners and angles of the forms and around reinforcement when consolidated, but will not segregate or exude free water during consolidation.

All materials used in the batch mixture should be carefully measured by weight or by volume.

Calcium chloride or other corrosive accelerators shall not be used unless otherwise specified. Water is conveniently measured by volume in containers marked off in gallons and half-gallons. Sand and gravel may be measured by volume in a 1 cubic foot bottomless box or other known volume containers. Portland cement is usually measured in sacks, each sack containing 94 pounds of cement or approximately 1 cubic foot.

A recommended concrete mixture is as follows: one sack of Portland cement to 2 cubic feet of sand to 3.5 cubic feet of gravel. If moderately moist sand and gravel (the usual condition) is used, then the amount of water to be added should be approximately 4.6 gallons per sack of regular cement or 4.1 gallons per sack of air- entrained cement. Change proportions of aggregate slightly if necessary to get workable mixes. Do not change proportions of water to cement unless moisture content in the aggregates is extremely high or low. In no case shall the water/cement ratio exceed 5.5 gallons of water per sack of cement. If a slump test is performed, the slump should range from 3 to 5 inches.

7. PLACING AND CURING TEMPERATURES

Concrete shall not be mixed nor placed when the daily minimum atmospheric temperature is less than 40 degrees Fahrenheit unless facilities are provided to prevent the concrete from freezing. The use of accelerators or antifreeze compounds will not be allowed. The materials shall be free from ice, snow, and frozen lumps before entering the mixer. Concrete, when deposited in the forms during cold weather, shall have a temperature of not less than 50 degrees Fahrenheit nor more than 90 degrees Fahrenheit. Concrete shall not be deposited on frozen ground nor in forms containing ice or frost. The minimum temperature of the concrete for the first 72 hours after placement shall not be less than the minimum temperature shown in the table below. Concrete structures shall be immediately protected after concrete placement by covering, housing, insulating, or heating concrete structures sufficiently to maintain the minimum temperature adjacent to the concrete surface. If the minimum temperature requirements are not met and the concrete did not freeze, the protection time will be extended a period equal to twice the number of hours the temperature was below the minimum temperature.

Least dimension of section, inches	Placement temperature, °F
Less than 12	55 – 75
12 to 36	50 – 70
36 to 72	45 – 65
Greater than 72	40 – 60

In hot weather, the installer shall apply effective means to maintain the temperature of the concrete below 90 degrees Fahrenheit during mixing, conveying, and placing.

Subgrade and forms shall be moistened prior to placing concrete.

8. CURING CONCRETE

All concrete placed above ground shall be cured for a period of at least 5 days by keeping all surfaces wet or by application of an approved commercial curing compound.

9. ITEMS OF CONSTRUCTION DETAIL

Items of work to be performed in accordance with this specification and construction details are:

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