

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

900 – CONCRETE (3000 psi)

I. SCOPE

Concrete work shall consist of furnishing and placing concrete to the dimensions, lines and grades as shown on the drawings. Concrete strength, shall be a minimum of 3,000 psi at 28 days unless otherwise specified on the “Practice Requirements” sheet.

II. MATERIALS

Cement. Portland cement shall conform to the requirements of ASTM C150 and shall be Type II or IIA unless otherwise specified in the “Practice Requirements” sheet. Cement shall be free of lumps and partially set masses.

Water. Water shall be potable and free from acid, alkali, oils or organic matter.

Aggregate. Shall be clean, hard, strong and durable, free from dirt and other substances deleterious to concrete. The fine and coarse aggregates shall be a well-graded mix approved by the Engineer. The maximum size of aggregate shall not exceed one and a half inches and conform to the requirements of ASTM C33.

Entrained Air. Air entraining shall conform to ASTM C260.

Fly Ash. Fly ash shall conform to the requirements of ASTM C 618, Class C or F.

Reinforcing Steel. Reinforcing steel shall be deformed bars conforming to the requirements of ASTM A615, Grade 40 or 60. Tie wires shall be 18-gage annealed steel.

Plain steel welded wire fabric reinforcement (flat sheets only, no rolled sheets) shall conform to ASTM A185.

Reinforcing steel shall conform to the grade, sizes, and shapes shown on the drawings.

Bar Supports. Bar supports and accessories shall be of the sizes required to provide the concrete cover specified. Where concrete surfaces are exposed to the weather, or liquid in hydraulic structures in finished work, galvanized or plastic-dipped metal bar supports shall not be used.

Precast concrete bar supports shall use the same class of concrete as specified for the concrete in the structure. The height of the block shall be the height

required to provide the cover specified for reinforcing. The block shall contain wires for securing the block to the reinforcement.

Form Coating. Form coating must not bond with, stain, or adversely affect concrete surfaces and shall conform to American Concrete Institute (ACI) 347. Form coating must not impair subsequent treatment of concrete surfaces, including bonding agents, curing compounds, and waterproofing. Form coating must be non-toxic or become non-toxic within 30 days.

Curing Compound. Liquid curing compound shall meet the requirements of ASTM C309 and be type 2.

III. DESIGN MIX

The following proportions will be accepted as 3000 psi strength concrete. Concrete shall be proportioned to include not more than six gallons of water per sack of cement or less than five and one half sacks of cement per cubic yard of concrete. Consistency of the concrete shall allow it to be worked into place without segregation. The slump shall be as follows:

Slump for Mix Designs

Condition	Slump (in.)
Massive sections, pavements, footings, caissons, substructure walls	2 ± 1
Thick slabs, heavy beams, columns, reinforced walls (>12 inches)	3 ± 1
Columns, light beams, thin slabs, thin walls (12 inches or less)	4 ± 1

Entrained Air. Air entrainment may be used; however, it shall not exceed six percent.

Fly Ash. Fly ash may be used as a partial substitution for portland cement in an amount not greater than 25 percent (by weight) of cement in the concrete mix unless otherwise specified.

Superplasticized concrete. A water-reducing admixture (ASTM C494, Type F or G) and/or a plasticizing admixture (ASTM C1017) may be used based on the manufacturer's recommendations with prior approval of the engineer. The contractor shall provide

evidence acceptable to the engineer that the resulting concrete will meet the minimum strength requirements.

The slump shall not exceed 7.5 inches unless the contractor can demonstrate before placement that the job mix can be placed without segregation or excessive laitance at a slump greater than 7.5 inches. The concrete shall retain the increased slump for not less than 30 minutes.

Superplasticized concrete can be conveyed and placed when the temperature of the concrete is below 95 degrees Fahrenheit and the slump of the concrete remains within the allowable slump range.

When a superplasticized concrete mix is used, forms shall be coated according to the manufacturer's recommendations with a form release agent that is specifically formulated for plasticized concrete. Forms shall be designed to withstand the increased pressures of the superplasticized concrete and the increased impact forces resulting from larger drop heights used in placing the superplasticized concrete.

IV. READY-MIX CONCRETE

The 3000 psi design mix and testing results, from the batch plant will be supplied to the Engineer for approval upon request or as shown on the "Practice Requirements" sheet.

When ready-mixed concrete is furnished, the supplier will provide the owner a delivery ticket that shows: time of loading; quantity of materials used, including water and any admixtures; revolution counter reading at time of loading.

V. MIXING

For stationary mixers, the mixing time after all cement and aggregates are in the mixer drum shall be not less than 1-1/2 minutes. When concrete is mixed in a truck mixer, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 or more than 100. Each batch shall be completely discharged before the mixer is recharged.

VI. FORMS

Forms shall conform to the shapes, lines, and dimensions as shown on the drawings. They shall be braced and/or tied together so as to maintain position and shape and be sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly covered with a form release agent or wetted and cleaned of debris prior to placement of concrete.

Forms shall not be removed without the approval of the Engineer.

VII. PLACEMENT

Concrete shall not be placed until the subgrade, forms, and reinforcing steel have been inspected by the Engineer.

Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete.

All reinforcement at the time of placement shall be free from rust, oil, grease, paint or other deleterious matter.

The concrete shall be deposited as closely as possible to its final position 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. The deposition of concrete shall be regulated so that the concrete may be consolidated with a minimum of lateral movement.

Concrete shall not be dropped more than five feet vertically unless suitable equipment is used to prevent segregation. When a superplasticized concrete mix is used, concrete shall not be dropped more than 12 feet vertically unless suitable equipment is used to prevent segregation.

Consolidation of concrete may be accomplished by means of internal type mechanical vibrators, rodding, spading, or hand tamping.

VIII. CONSTRUCTION JOINTS

Construction joints shall be provided as shown in the drawings or as approved by the Engineer. Joints shall be thoroughly cleaned and laitance removed before a new placement is made. Each joint shall be wetted immediately before the placing of new concrete.

IX. FINISHING

After the concrete has been consolidated, the unformed surfaces shall be given a float finish.

Immediately after form removal, formed surfaces shall be cleaned of all fins and irregular projections from exposed surfaces. All defective concrete shall be removed and effectively repaired.

X. PROTECTION AND CURING

Concrete shall be prevented from drying for a curing period of at least seven days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. Moisture shall be maintained by sprinkling, flooding, or fog spraying or by covering with continuously moistened canvas, burlap, cloth mats, straw earth or other approved material. For formed surfaces, the protection may be accomplished by leaving the forms in place and keeping them wet for

the entire curing period. In lieu of water curing, the concrete shall be protected by spraying with an approved curing compound. The curing compounds shall be applied in an approved manner immediately after the concrete is finished. All surfaces shall be kept moist until the compound is applied.

The curing compound shall be applied at the rate of one gallon per 175 square feet.

XI. CONCRETING IN COLD WEATHER

Before any concrete is placed, all ice, snow, and frost shall be completely removed from all surfaces to be in contact with the new concrete, and the temperature of these surfaces shall be raised to as close as may be practical to the temperature of the new concrete that is to be placed thereon. No concrete shall be placed on a frozen subgrade or on one that contains frozen materials.

When the atmospheric temperature may be expected to drop below 40°F at the time concrete is placed, or at any time during the curing period, the following provisions also shall apply:

- A. The temperature of the concrete at the time of placing shall not be less than 50° F or more than 90° F. The temperature of neither aggregates nor mixing water shall be more than 100° F just prior to mixing the cement.
- B. When the daily minimum temperature is less than 40° F, mortar shall be insulated or housed and heated after placement. The temperature of the concrete and air adjacent to the mortar shall be maintained at not less than 50° F or more than 90° F for the duration of the curing period.
- C. Methods of insulating, housing and heating the structure shall conform to "Recommended Practice for Cold Weather Concreting", ACI Standard 306.
- D. The use of accelerators or antifreeze compounds will not be allowed.
- E. When dry heat is used protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with a curing compound or is covered tightly with an approved impervious material.

XII. CONCRETING IN HOT WEATHER

When climatic or other conditions are such that the temperature of concrete may reasonably be expected to exceed 90° F at the time of placement, or during the first 24 hours after placement, the following provisions also shall apply:

The temperature of the concrete shall be maintained below 90° F during mixing, conveying, and placing. Methods used shall conform to "Recommended

Practice for Hot Weather Concreting", ACI Standard 305.

Exposed concrete surfaces that tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or otherwise protected from drying immediately after placement.

Concrete surfaces exposed to the air shall be covered as soon as the concrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period, and for the entire curing period unless curing compound is applied as specified in Section X.

If moist curing is discontinued before the end of the curing period, curing compound shall be applied immediately.

XIII. STRUCTURE DRAINAGE

Graded sand and gravel filters or filter drains shall be constructed as shown on the drawings or as staked in the field.

Trenches for the filter drains shall be excavated to lines, shape and dimensions shown on the drawings. The sand and gravel shall be placed and tamped in place to the dimensions shown. When drainpipes are used, they will be installed on line and grade without displacement due to placement of filter material.

The filter material shall conform to the following gradation unless otherwise specified:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
2"	85-90
3/4"	50-90
No. 16	15-50
100	0-10
200	0-3

XIV. STRUCTURAL BACKFILL

The work shall consist of all earthfill adjacent to the structures.

Materials. The fill materials shall be the in place excavated materials unless otherwise stated in the "Practice Requirements" sheet and shown on the drawings.

Placement. The fill shall be placed so that the distribution of materials will be to the limits shown on the drawings and shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. No fill shall be placed upon a frozen surface nor shall

snow, ice or frozen material be incorporated in the fill.

Fill shall not be placed until the following time has elapsed after concrete placement:

Walls or slabs	14 Days
Conduits, Precast, Cradles	2 Days
Conduits, Precast, Bedded	1 Day
Antiseep Collars	3 Days

The fill shall be placed in a manner adequate to prevent damage to the structure and allow the structure to gradually and uniformly assume the backfill loads. The maximum lift thickness prior to compaction shall be 6 inches.

Moisture Content. The soil moisture of the fill material shall be sufficient to hold a ball shape when squeezed in the hand, unless otherwise stated and shown on the drawings.

Compaction. The fill material shall be compacted to a density equal to that of the adjacent materials. Compaction shall be accomplished by hand tampers or other acceptable means excluding heavy equipment. Heavy equipment shall not be operated within two feet of any structure.

The passage of heavy equipment will not be allowed over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one half the clear span width of the structure or pipe or two feet, whichever is greatest.

XV. SURFACE DRAINAGE

After completion of the backfill operations, the surface area adjacent to and around the structures shall be graded to convey surface runoff away from the structure.