

## Section 8 - Concrete Construction

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## Overview

This section includes specifications regarding all material, equipment, and labor required for concrete construction, including manholes, headwalls, footings, foundations, piers, drainage structures, curb and gutter, sidewalk, etc. as specified, as shown on the Plans and as directed by the Engineer.

Concrete strength and mix design shall be as specified for each type of facility, as shown on the Plans, and as directed by the Engineer. Concrete shall conform to SCDOT requirements for Class A concrete (3,000 psi 28-day compressive strength) or Class B concrete (2,500 psi 28-day compressive strength) as indicated. Mixing shall be accomplished at an approved central mix plant in accordance with ASTM C94, *Standard Specification for Ready-Mixed Concrete*. Unless specifically approved by the Engineer, job site mixing will not be allowed. Mix designs shall be submitted to the Engineer for approval prior to placement.

## **Chapter 1 – Concrete Cylinders**

Concrete Cylinders for testing purposes shall be made in accordance with ASTM C 31, *Standard Practice for Making and Curing Concrete Test Specimens in the Field*. Testing shall be done by a laboratory approved by the Engineer. Each test shall consist of at least four (4) specimens; two (2) for field control and (2) two for laboratory control. One (1) initial test will be required and then on (1) test for each one hundred (100) yards thereafter. All testing will be performed at the discretion of the Engineer at the Contractors expense.

## **Chapter 2 – Placing of Concrete**

Placing of concrete shall be in daylight hours and no concrete shall be placed when the atmospheric temperature is below thirty-five degrees Fahrenheit (35 °F). Concrete mixed at a central plant shall be transported to the job site as per ASTM C94, *Standard Specification for Ready-Mixed Concrete*. Concrete shall be compacted with mechanical, internal-vibrating equipment and/or with hand spading with a slicing rod. Earth fill shall not be placed on fresh concrete until it has been allowed to set twenty-four (24) hours.

### **Section 2.0 – Form Work**

2.00 Form work shall be built to conform to the shape, lines and dimensions of the concrete work as shown. Forms shall be set to line and grade, and shall be braced, tied, and secured in a manner which will withstand placing of the concrete and which will maintain shape and position. Forms shall be tight and be substantially assembled to prevent bulging and the leaking of concrete. Joints may be arranged vertically or horizontally as required. Temporary openings shall be arranged, where required, at the bottoms of wall forms and elsewhere, to facilitate cleaning and inspecting. Used formwork shall have nails removed and surfaces in contact with concrete thoroughly cleaned before reuse. Wall sleeves, inserts, and openings required in concrete work shall be securely set to alignment and elevation. Chamfer strips shall be placed in forms for all exterior corners.

2.01 Under normal conditions, the time elapsing before the forms may be stripped shall not be less than the following:

2.01.0 Slabs – fourteen (14) days

2.01.1 Piers – seven (7) days

2.01.2 Walls – two (2) days

### **Section 2.1 – Finishing**

All exposed concrete surfaces shall be kept wetted with water, and shall be rubbed with a carborundum stone of medium fineness, or other equal abrasive, to bring the surface to a smooth texture and to remove all form and other marks. The paste formed by the rubbing may be rubbed down by floating with a canvass, carpet-faced, or cork float, or may be rubbed down with dry burlap.

## **Chapter 3 – Expansion Jointing**

### **Section 3.0 – Materials**

Material used for expansion joint shall be preformed joint filler of either sponge rubber (Type I) or polyurethane-bonded recycled rubber (Type IV) material that meets AASHTO M 153 (*Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction*) or semi-rigid, closed-cell polypropylene foam that meets ASTM D8139 (*Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction*). Other materials such as polyvinyl chloride (PVC) may be used, if the PVC meets the recovery, compression, and extrusion requirements in either of the above referenced specifications. Do not use non-extruding and resilient bituminous (AASHTO M 213) types of preformed joint filler.

### **Section 3.1 – Location**

Expansion joints shall be installed as specified on the plans and at the following locations:

- Where sidewalk is constructed between an adjoining substantial structure on one side and curbing on the other side, from an expansion joint adjacent to the curbing.
- Place an expansion joint between the sidewalk and the radius curbing at street intersections.
- Where concrete sidewalks or medians are constructed adjacent to existing or new concrete pavement structure, place a transverse expansion joint in the sidewalk or median opposite such joints in the concrete pavement or structure.
- Where existing structures such as light standards, poles, fire hydrants, etc., are within the limits of the sidewalk or median area, surround the structures with an expansion joint.
- Place transverse expansion joints at intervals of not more than fifty (50) feet in concrete sidewalk.
- Place transverse expansion joints at intervals of not more than one hundred (100) feet in concrete curbing.

## **Chapter 4 – Reinforcing Steel**

Reinforcing steel, structural steel, miscellaneous iron, and steel and iron castings shall be as specified, as shown on the Plans, and as called for in the work to which they pertain.

4.00 The Contractor shall furnish to the Engineer for review six (6) copies of bending and placing details for steel bar reinforcing which show bar size, spacing, bending, and tagging identification.

4.01 Bar reinforcement and wire mesh shall be furnished by domestic steel mills. Steel bar reinforcement shall conform to the requirements of ASTM A615, *Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement*, (Grade 60), and shall be of an approved deformed type. Bars shall be cold bent to the dimensions indicated on the drawings. Bending shall be done in the shop unless otherwise specified and shall conform to the requirements of ACI Building Code (ACI-318). Bars shall be furnished full lengths unless otherwise indicated on the drawings, or approved by the Engineer. Bars shall be placed in the locations shown on the drawings and held securely in place during the placing of concrete. Bars shall be spaced the proper distance from the face of the wall by the use of approved precast concrete mortar blocks and/or steel chairs with plastic coated legs or plastic tips or stainless steel chairs.

Wire mesh reinforcement shall conform to the requirements of ASTM A185, *Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete*, and unless otherwise indicated on the Drawings, shall be four-inch by four-inch (4" x 4") mesh, of six (6) gauge wire. Wire mesh shall be secured in position by space bars and chairs or pre-cast concrete mortar blocks.

4.02 Miscellaneous iron and steel for straps, brackets and related items shall conform to ASTM A36, *Standard Specification for Carbon Structural Steel*, with a minimum yield strength of thirty-six thousand pounds per square inch (36,000 psi) and shall be as shown on the Plans.

Carbon steel bolts and nuts shall conform to ASTM A307, *Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength*, unless otherwise shown on Drawings. Bolts and nuts in general shall be United States standard dimension. All anchor bolts exposed to the weather shall be of stainless steel Type 316, unless otherwise specified. Anchor bolts in general shall be placed in forms prior to pouring concrete. When concrete anchors must be used, they shall be Phillips "Red Head", Rawl "Saber Tooth" self-drilling anchors, or equal.

Welding under these Specifications may be done by the MIG, TIG, or "Electrode" method in accordance with AWS-ASTM E 6012, (Electrode Method only).