

## Technical Specification 027.01

### CAST-IN-PLACE CONCRETE

#### 1.0 General

- a) This specification gives general guidance and requirements for cast in place Portland cement concrete work. Additional requirements may be required by the Engineer for the project and will be shown on the plans approved by the Brunswick County.
- b) Concrete shall consist of a mixture of Portland cement, aggregates, and water, and shall be proportioned in accordance with the requirements of this specification. Admixtures shall be included with these primary ingredients only when specifically authorized.

#### 2.0 Reference Standards and Specifications

- a) ASTM C-143: Concrete Slump Testing
- b) Brunswick County Technical Specification TS 026.01: Concrete Reinforcement

#### 3.0 Proportions and Consistency

- a) In proportioning concrete materials one (1) bag (sack) of cement shall be considered as being one (1) cubic foot volume and ninety-four (94) pounds weight. Portland cement shall be measured by weight when bulk cement is used and where in batching it is necessary to use a portion of a bag. Otherwise, for bag cement, the bag weight of ninety-four (94) pounds may be used.

#### 4.0 Mixing and Delivery

- a) All concrete under this specification shall be consider machine mixed, where the volume to be placed is equal to or greater than (1) cubic yard. Hand mixing is allowed where the volume to be placed is less than (1) cubic yard, for example, for thrust blocking as requirement by County standard details.
- b) Mixers shall be stationary or truck mixers. The mixer drum shall be of adequate size to accommodate the maximum batch and shall be rotated at the rate specified by the manufacturer. The mixer shall be equipped with an automatic timing device to prevent discharge of the concrete until the specified mixing time has elapsed.
- c) The minimum mixing time for concrete shall be that minimum time specified both by the Engineer or the manufacturer and in accordance with industry standards.
- d) Central plant ready mix concrete is acceptable and shall be delivered to the work site with adequate plasticity and workability. Ready Mix concrete shall be delivered to the work site and pouring begun with a period of one and one half

(1½) hours after the introduction of water to the cement and aggregates.

- e) Hand mixing shall be permitted when the amount of concrete required for any job is less than one (1) cubic yard. Hand mixed concrete shall be mixed on a watertight platform or in a mortar box in batches not to exceed 1/3 cubic yards each. The aggregate shall first be spread in a uniform layer over which the required quantity of cement shall be evenly distributed. The entire batch shall be turned with shovels until the ingredients are thoroughly blended before adding the water. After adding the proper amount of water, the batch shall again be turned with shovels until a uniform consistency is obtained.
- f) Any central plant ready mix, or hand mixed, concrete shall not be used if the mixture fails the slump test, or is rejected by the Engineer or County staff.

## **5.0 Concrete Consistency**

- a) The consistency of the concrete shall be determined by the slump test as referenced in ASTM C-143 and / or specified by the Engineer. Slump of a given mix may be increased by adding water, increasing the percentage of fines (cement or aggregates), entraining air, or incorporating an admixture that reduces water requirements.
- b) The slump specified by the Engineer shall yield the desired consistency with the least amount of cement and water.
- c) Admixtures shall only be used when approved by the Engineer or Brunswick County staff.

## **6.0 Concrete Reinforcing**

- a) All concrete reinforcing shall be installed by the contractor and inspected and approved by the Engineer prior to pouring concrete.

## **7.0 Special Precautions in Freezing Weather**

- a) Frozen aggregates or aggregates containing lumps of frozen material shall be thawed before using.
- b) When the temperature falls to or below thirty-eight (38) degrees Fahrenheit, no concrete work of any kind is to be done except by special permission of the Engineer, and then strictly according to his direction.

## **8.0 Handling and Placing Concrete**

- a) No concrete shall be used which does not reach its final position in the forms within one (1) hour after water is first added to the mix, except when concrete is continually agitated, when the time may be extended to one and one-half (1 ½) hours.

- b) Concrete shall be placed so as to avoid segregation of the materials and the displacement of the any installed reinforcement.
- c) The use of long chutes for conveying concrete from the mixer will be permitted only with permission of the Engineer. In case an inferior quality of concrete is produced by the use of long chutes, the Engineer may order discontinuance of their use and the substitution of a satisfactory method of placing the concrete.
- d) All chutes, troughs and pipes shall be kept free from coatings of hardened concrete by thoroughly flushing with water after each run; water used for flushing shall be discharged clear of the concrete already in place.
- e) Concrete shall not be dropped a distance of more than five (5) feet, and special care shall be taken to fill each part of the form by depositing the concrete as near final position as possible. The coarse aggregate shall be worked back from the face and the concrete forced around the reinforcement without displacing the bars.
- f) After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of the projecting reinforcement.
- g) Concrete shall be compacted by continuous working with a suitable tool or by vibrating the forms in a manner acceptable to the Engineer.
- h) Concrete shall be placed in horizontal layers not more than twelve (12") thick, except as approved by the Engineer.
- i) Each layer shall be placed and compacted before the preceding batch has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the batches.
- j) Each layer shall be compacted so as to void the formation of a construction joint with a preceding layer which has not taken initial set.
- k) All concrete shall be placed so as to be properly finished and curing begun during daylight hours. At no time shall concrete be placed which will require the finishing, etc., to be performed by artificial light. Paving operations shall be as scheduled by the Engineer.

## **9.0 Inspection**

- a) Proper facilities shall be provided for the inspection and sampling of concrete at the mixing plant, loading plant, and place of delivery, or as directed by the Engineer.
- b) The manufacturer shall afford the inspector, without charge to the County, all reasonable facilities for securing samples to determine if the concrete is being furnished in accordance with the Contract Documents and as specified by the Engineer. All inspection and sampling shall be so conducted as not to interfere unnecessarily with the manufacture and delivery of the concrete.

**10.0 Finishing and Curing of Concrete:**

- a) Concrete for curb, curb and gutter, sidewalk and driveways shall have a broomed finish. The surface shall be screened and tamped with a special tool to force the coarse aggregate away from the surface, floated to bring the surface to the required finish level, steel-toweled to an even, smooth surface and broomed with a fiber bristle brush. The surface shall be of uniform texture.
- b) Curing shall be accomplished by preventing loss of moisture, rapid temperature change, and mechanical injury or injury from rain or flowing water for a period of seven (7) days when normal portland cement has been used or three (3) days when high-early-strength portland cement has been used. Curing shall be started after placing and finishing the concrete is finished, and after all free water has disappeared from the surface of the concrete.
- c) Moist curing may be accomplished by covering with burlap, cotton, or other approved fabric mats, or with sand and shall be kept continually wet. Forms shall be kept continually wet and not removed before the end of the curing period.

**11.0 Sampling and Testing:**

- a) The contractor shall provide three (3) cylinders for breaking at seven (7) days and three (3) cylinders for breaking as twenty-eight (28) days, or as directed by the Engineer.
- b) The concrete shall meet or exceed the specified strength in the Contract Documents or as specified by the Engineer, at both the seven (7) day test and the twenty-eight (28) day test. Failure to meet the specified strength tests is grounds for rejection of the work.
- c) The contractor shall hire an approved independent testing firm to perform all required concrete testing and will be reimbursed for payment of successful concrete strength tests per the terms in the Contract Documents.
- d) Test results shall be delivered to the Engineer by the testing laboratory with copies sent to the contractor and Brunswick County.