

**SECTION 03 31 16**  
**LIGHTWEIGHT STRUCTURAL CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. All materials, tools, labor and equipment in connection with the furnishing and installation of lightweight concrete, complete, in place, as shown on the Contract Drawings and specified herein.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- B. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- C. Section 03 20 00 - Concrete Reinforcing
- D. Section 03 30 00 - Cast-in-Place Concrete

**1.03 REFERENCE STANDARDS**

- A. ACI 301 - Structural Concrete.
- B. ASTM C 39 - Compressive Strength of Cylindrical Concrete Specimens.
- C. ASTM C 150 - Portland Cement.
- D. ASTM C 173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
- E. ASTM C 192 - Making and Curing Concrete Test Specimens in the Laboratory.
- F. ASTM C 260 - Air-Entraining Admixtures for Concrete.
- G. ASTM C 330 - Lightweight Aggregates for Structural Concrete.
- H. ASTM C 567 - Unit Weight of Structural Lightweight Concrete.

**1.04 SUBMITTALS**

- A. See Section 01 33 00 – Submittal Procedures, for submittal procedures.
- B. Concrete mix design in accordance with Appendices A and B of this Section.
- C. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

**1.05 QUALITY CONTROL**

- A. Design Mixes and Tests:
  - 1. All mix designs shall be proportioned in accordance with ACI 318, Section 5.3 "Proportioning on the Basis of Field Experience and/or Trial Mixtures". When pozzolans (fly ash or silica fume) are used, the total weight of pozzolans shall not exceed the percentages of the total weight of cementitious materials given in ACI 318. The Design-builder shall have an independent testing laboratory, approved by the Engineer, prepare the design of mixes for the strength of concrete indicated on the Contract Drawings and as specified herein. Tests and trial mixes shall be performed in accordance with ASTM C 192 and ASTM C 39. The design mix and test data including the proportions of cement, fine aggregate, coarse aggregate, water, and admixtures (if any) shall be submitted to the Engineer for approval.
  - 2. Design-builder may use previously accepted (within the past year) mix proportions of aggregates having the same specific gravity, size, and gradation; cements of the same type and batch weight; admixtures of the same type of quality; other ingredients of the same or equal and having the same water-cement ratio. If any of the mix proportions or ingredients are changed, a separate submission for acceptance shall be required.
  - 3. 3. When the concrete is placed by pumping, trial mixes shall be prepared and tested in accordance with ASTM C 39 and C 192. The coarse and fine aggregates shall have

grading in accordance with ACI 304. Design-builder is required to submit the mix design, slumps at the pump and at the discharge end, and the pumping scheme. All pumped concrete shall contain superplasticizer.

## **PART 2 PRODUCTS**

### **2.01 CONCRETE**

- A. Lightweight aggregate shall be expanded clay or shale produced by the rotary kiln process and shall meet the requirements of ASTM C 330.
- B. Cement shall conform to the requirements for Portland cement of ASTM C 150, Type I or Type II. The minimum cement content of 564-pounds per cubic yard shall be maintained. In addition, the cement shall be low alkali content with maximum percentage limited to 0.06-percent.
- C. Water shall be potable and free from deleterious amounts of alkali, acid and organic materials which would adversely affect the setting time or strength of the concrete.
- D. Concrete shall have the following physical properties:
  - 1. An air-dry weight of 110- to 115-pounds per cubic foot as determined by ASTM C 567.
  - 2. A minimum compressive strength of 4,000-psi at 28-days when tested in accordance with methods stated in ASTM C 330.
- E. All concrete exposed to freezing and thawing conditions shall be air-entrained, 5-percent plus or minus 1-1/2-percent of volume in accordance with ASTM C 173. Air-entraining admixtures shall conform to the requirements of ASTM C 260.
- F. Admixtures shall be the same types and proportions used in the approved design mix as required by Paragraph 1.05A. Design-builder may propose the use of admixtures for his own benefit, provided the use of mixtures conforms to these specifications. Design-builder shall submit a request in writing to the Engineer, stating type and quantity proposed, and shall obtain the Engineer's approval before incorporating any admixture in the Project. Once approved, the type and quantity of admixture used shall not be varied without the permission of the Engineer. Admixtures shall not be used to replace cement. See Appendix C of this Section.

### **2.02 OTHER MATERIALS**

- A. All other materials, not specifically described but required for a complete and proper installation, shall be selected by Design-builder subject to the approval of the Engineer.

## **PART 3 EXECUTION**

### **3.01 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Quality control of the mixing, testing, placing, finishing, and curing of structural lightweight concrete shall be in accordance with Section 03300.

**END OF SECTION 03 31 16**