

Guide Specification for Structural Lightweight Concrete

This Guide Specification has been prepared to supplement the Architect-Engineer's standard concrete specifications where structural lightweight concrete is to be used.

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

- 1.1.1 American Society for Testing and Materials (ASTM) – latest edition
- C 31 Standard Method of Making and Curing Concrete Test Specimens in the Field
 - C 33 Standard Specification for Concrete Aggregates
 - C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - C 94 Standard Specification for Ready-Mixed Concrete
 - C 138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
 - C 143 Standard Test Method for Slump of Portland Cement Concrete
 - C 150 Standard Specification for Portland Cement
 - C 172 Standard Practice for Sampling Freshly Mixed Concrete
 - C 173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
 - C 260 Standard Specification for Air-Entraining Admixtures for Concrete
 - C 330 Standard Specification for Lightweight Aggregates for Structural Concrete
 - C 494 Standard Specification for Chemical Admixtures for Concrete
 - C 567 Standard Test Method for Determining Density of Structural Lightweight Concrete
 - C 595 Standard Specification for Blended Hydraulic Cements
 - C 666 Standard Test Method for Resistance of Concrete To Rapid Freezing and Thawing

- 1.1.2 American Concrete Institute (ACI) – latest edition
ACI 318 Building Code Requirements for Structural Concrete

1.2 STORAGE OF MATERIALS

- 1.2.1 Cement: Store in weather tight enclosures and protect against dampness, contamination and warehouse set in accordance with ACI 318.
- 1.2.2 Aggregates: Each gradation of lightweight aggregate, as supplied, shall be stockpiled in separate bins or piles. Storage and handling shall minimize segregation and prevent contamination.

PART 2 – PRODUCTS

2.1 MATERIAL

- 2.1.1 CEMENT: ASTM C 150 or C 595. Air-entraining cement will not be permitted.
- 2.1.2 AGGREGATE: STALITE or approved equal expanded slate produced by the rotary kiln method conforming to ASTM C 330. A durability report shall be available showing that concrete made from the aggregate has a minimum durability factor of 90% when tested in accordance with ASTM C 666. Natural or manufactured sand shall conform to ASTM C 33.
- 2.1.3 MIXING WATER: Clean and free from injurious amount of oils, acids, alkalis, organic materials or other deleterious substances, in accordance with ACI 318.
- 2.1.4 ADMIXTURES:
- 2.1.4.1 AIR-ENTRAINING AGENTS: ASTM C 260.
 - 2.1.4.2 WATER REDUCING ADMIXTURES: ASTM C 494. Admixtures may be used provided they have a proven satisfactory performance record with structural concrete and are approved by the Architect-Engineer.
 - 2.1.4.3 ACCELERATING ADMIXTURES: ASTM C 494. Admixtures may be used only with the approval of the Architect-Engineer.
 - 2.1.4.4 RETARDING ADMIXTURES: ASTM C 494. Admixtures may be used only with the approval of the Architect-Engineer.

2.2 CONCRETE PROPERTIES

- 2.2.1 Materials shall be proportioned to produce concrete with a minimum compressive strength of _____ psi (_____ MPa) at 28 days.
- 2.2.2 Materials shall be proportioned to produce concrete with a maximum calculated equilibrium density of _____ pcf (_____ kg/m³).

2.2.3 Concrete shall be delivered at the minimum slump necessary for efficient mixing, placing and finishing. The maximum slump shall be 4 in. (100mm) with a tolerance of ± 1 in. (± 25 mm).

2.2.4 The air content shall be 6% by volume with a tolerance of $\pm 1.5\%$.

2.2.5 The contractor shall furnish the mix design for the strength and density of concrete specified. The mix design shall be prepared by a qualified testing laboratory and may be based upon recommendations of the aggregate producer. The mix design shall be subject to the approval of the Architect-Engineer.

2.2.6 The concrete shall be batched and mixed in accordance with ASTM C 94.

PART 3 – CONTROL

3.1 FIELD CONTROL

- 3.1.1 The control of the concrete shall be under the supervision of the Architect-Engineer.
- 3.1.2 Samples of concrete shall be obtained in accordance with ASTM C 172, and shall be transported to a place on the site where tests can be made and cylinders stored without being disturbed for the first 24 hours.
- 3.1.3 Compressive strength test specimens shall be made in accordance with ASTM C 31 for each of the following conditions:
- 3.1.3.1 Each day's placing
 - 3.1.3.2 Each type of concrete
 - 3.1.3.3 Each change of supplier or source
 - 3.1.3.4 Each 150 cu. yd. (115m³) of concrete and fraction thereof.
- 3.1.4 Compressive strength specimens shall be tested in accordance with ASTM C 39.
- 3.1.5 Density, slump and air content of fresh concrete shall be determined from each batch of concrete sampled for compressive strength tests. Fresh density, slump and air content shall be determined by ASTM C 138, C 143, and C 173 respectively. Equilibrium density shall be determined by ASTM C 567.

APPENDIX

The following is a list of ACI publications that will be of assistance to the Architect-Engineer when preparing specification for the use of structural lightweight aggregate concrete.

- ACI 211.2 *Recommended Practice for Selecting Proportions for Structural Lightweight Concrete*
- ACI 212.2R *Guide for Use of Admixtures in Concrete*
- ACI 213R *Guide for Structural Lightweight Aggregate Concrete*
- ACI 302 *Recommended Practice for Concrete Floor and Slab Construction*
- ACI 304 *Recommended Practice for Measuring, Mixing, Transportation and Placing Concrete*
- ACI 305R *Hot Weather Concreting*
- ACI 306R *Cold Weather Concreting*
- ACI 347 *Recommended Practice for Concrete Formwork*
- SP-2 *ACI Manual of Concrete Inspection, ACI Committee 311*

