

Guide for Precast Cellular Concrete Floor, Roof, and Wall Units

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This guide presents information on materials, fabrication, properties, design, and handling of precast concrete floor, roof, and wall units having oven-dry unit weights of 50 pcf (800 kg/m³) or less. The concrete achieves the low density through the use of gas-releasing agents or the mechanical incorporation of air.

Keywords: cellular concretes; concrete construction; concrete slabs; deflection; floors, lightweight concretes; precast concrete; prefabrication; roofs; structural design; thermal conductivity; walls.

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CHAPTER 1—GENERAL**1.1—Objective**

The primary objective of this guide is to outline practices for design and fabrication of precast reinforced cellular concrete (50 pcf [800 kg/m³] and under) floor, roof, and wall units that will result in structural members of adequate load capacity, durability, appearance, and overall serviceability for the function intended. Units covered by this Guide should be protected from exposure to weather.

1.2—Scope

The recommendations of this Guide apply to precast reinforced cellular concrete units, which are designed and factory-produced for use in structures. These recommendations are based largely on the experience gained with a large variety of units in service. The report does not cover job site fabrication.

1.3—Definition of cellular concrete

This Guide includes precast concretes having oven-dry unit weights, as measured by ASTM C 495, of 50 pcf (800 kg/m³) or less. The material, which is commonly referred to as *cellular or aerated concrete*, may be defined as:

A lightweight product consisting of portland cement and/or lime with siliceous fine material, such as sand, slag, or fly ash, mixed with water to form a paste that has a homogeneous void or cell structure. The cellular structure is attained essentially by the inclusion of macroscopic voids resulting from a gas-releasing chemical reaction or the mechanical incorporation of air or other gases (autoclave curing is usually employed).

CHAPTER 2—MATERIALS**2.1—Sand**

Sands conforming to ASTM Specifications C 33 and C 144 are acceptable.

2.2—Fly ash

Fly ash should conform to ASTM C 618.

2.3—Hydraulic cements

Cement should conform to ASTM Specifications C 150 or C 595.

2.4—Lime

Lime should conform to ASTM C 911.

2.5—Foaming agents

Cellular concrete foaming agents shall conform to ASTM C 796 and C 869.

2.6—Mixing water

Mixing water for concrete should be clean and free from injurious amounts of oils, acids, alkalies, salts, organic matter, or other potentially deleterious substances.

2.7—Admixtures

Air-entraining, accelerating, retarding, water-reducing, or pozzolanic admixtures may be used, if desired, provided that they conform to ACI 318. Information on such materials is available in ACI Report 212.3R.

Calcium chloride and accelerators containing chloride salts should not be used when steel reinforcement or uncoated aluminum members are embedded in or in contact with the concrete.

2.8—Reinforcement

2.8.1—Reinforcement should be weldable steel conforming to ASTM Specifications A 615, A 82, or A 185. Electrical resistance spot welding is usually employed to fabricate the reinforcing steel cage or mesh. All welding should conform to AWS D12.1.

2.8.2—Reinforcement in cellular concrete units should be protected by a corrosion-inhibiting coating such as a latex-modified portland cement slurry or hot dipped zinc coating.

CHAPTER 3—CONCRETE PROPERTIES**3.1—Compressive strength**

Low-density concrete used in precast reinforced cellular concrete floor, roof, and wall units should have a minimum compressive strength of 300 psi (2.07 MPa). The compressive strength of these units should be determined by ASTM C 495, ASTM C 513, or ASTM C 796, whichever is applicable.

3.2—Drying shrinkage

The potential drying shrinkage of cellular concretes should be determined on three specimens, in accordance with ASTM C 426 or ASTM C 341. The average drying shrinkage should not be in excess of 0.20 percent. The test should be conducted employing either a test specimen cut from a manufactured unit that is unreinforced or at least has no steel reinforcement in the longitudinal direction or molded from the same batch of concrete from which the units are made. The specimens should be 2 in. x 2 in. (50 mm) in cross section and of sufficient length to provide the 10 in. (254 mm) gage length required. Specimens should be conditioned by immersion in water at 73 ± 2 F (23 ± 1.1 C) for 48 hr. Length measurements should commence immediately upon removal from the water.

3.3—Thermal insulation values

The thermal conductivity of cellular concrete should be measured by means of the Guarded Hot Plate (ASTM C 177) or the Heat Flow Meter (ASTM C 518). When test data for a specific concrete are not available, Table 3.3 may be used as a general guide.

**Documents**

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