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StandardSpecification for Precast Autoclaved Aerated Concrete (AAC) Wall Construction Units[1]

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1. Scope

1.1 This specification covers solid nonload-bearing and load-bearing precast concrete wall units made from autoclaved aerated concrete. Precast autoclaved aerated concrete (AAC) is a cementitious product based on calcium silicate hydrates in which low density is attained by the inclusion of an agent resulting in macroscopic voids and is subjected to high-pressure steam curing. The precast autoclaved aerated concrete wall units are large-size solid rectangular prisms, which are to be laid using thin-bed mortar. Installed units covered by this specification shall be protected against direct exposure to moisture using a coating material accepted by the AAC manufacturer.

1.2 The raw materials used in the production of precast autoclaved aerated concrete are portland cement, quartz sand, water, lime, gypsum or anhydrite, and an agent resulting in macroscopic voids. The quartz sand used as a raw material may be replaced by a siliceous fine aggregate other than sand, and usually is ground to a fine powder before use. Fly ash may be used as a sand replacement. The batched raw materials are mixed thoroughly together to form a slurry. The slurry is cast into steel molds. Due to the chemical reactions that take place within the slurry, the volume expands. After setting, and before hardening, the mass is machine cut into units of various sizes. The units then are steam-cured under pressure in autoclaves where the material is transformed into a hard calcium silicate.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* See Section 8, Section 9, and Section 10.

2. Referenced Documents

2.1 *ASTM Standards:*[2]
C22/C22M Specification for Gypsum
C33 Specification for Concrete Aggregates
C144 Specification for Aggregate for Masonry Mortar
C150 Specification for Portland Cement
C332 Specification for Lightweight Aggregates for Insulating Concrete
C595 Specification for Blended Hydraulic Cements
C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
E4 Practices for Force Verification of Testing Machines

3. Classification

3.1 AAC units manufactured in accordance with this specification are classified according to their strength class.

4. Materials and Manufacture

4.1 *Raw Materials*—Materials shall conform to the following applicable specifications:
4.1.1 *Portland Cement,* Specification C150.
4.1.2 *Blended Cements,* Specification C595.
4.1.3 *Pozzolan,* Specification C618.
4.1.4 *Gypsum,* Specification C22/C22M.
4.1.5 *Aggregates,* Specifications C33, C144, or C332.

5. Physical Requirements

5.1 *Compressive Strength*—The compressive strength of the units shall be determined according to Section 8 and shall conform to the requirements of Table 1.

5.2 *Dry Bulk Density*—The dry bulk density shall be determined according to Section 9 and shall conform to the requirements of Table 1.

5.3 *Drying Shrinkage*—The drying shrinkage shall be determined in accordance with Section 10, and the average drying shrinkage shall conform to the requirements of Table 1.

[1] This specification is under the jurisdiction of ASTM Committee C27 on Precast Concrete Products and is the direct responsibility of C27.60 on Precast Autoclaved Aerated Concrete.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Physical Requirements

Strength Class	Compressive Strength, psi (MPa), min	Nominal Dry Bulk Density lb/ft^3 (kg/m^3)	Density Limits, lb/ft^3 (kg/m^3)	Average Drying Shrinkage, %
AAC-2	290 (2.0)	25 (400)	22 (350)–28 (450)	
		31 (500)	28 (450)–34 (550)	
AAC-4	580 (4.0)	31 (500)	28 (450)–34 (550)	≤ 0.02
		37 (600)	34 (550)–41 (650)	
		44 (700)	41 (650)–47 (750)	
AAC-6	870 (6.0)	37 (600)	35 (550)–41 (650)	
		44 (700)	41 (650)–47 (750)	
		50 (800)	47 (750)–53 (850)	

6. Dimensions and Permissible Variations

6.1 The dimensions of the units shall be as specified by the AAC manufacturer.

6.2 No overall unit dimension (width, height, and length) shall differ by more than ⅛ in. (3 mm) from the specified standard dimensions.

7. Visual Inspection

7.1 All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Minor imperfections incidental to the usual methods of manufacture, or resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

8. Compressive Strength Test

8.1 *Apparatus:*

8.1.1 *Testing Machine*—The testing machine shall conform to the requirements prescribed in Practice E4. The machine shall be equipped with two steel bearing blocks one of which is a spherically seated block that will transmit load to the upper surface of the specimen, and the other a plane rigid block on which the specimen will rest.

8.2 *Test Specimens:*

8.2.1 Three cube specimens of 4 in. (100 mm) edge length shall be tested in an air dried condition (5 to 15 % by mass moisture content). If the samples have to be dried before testing to reach that moisture content, they shall be stored at a temperature not exceeding 158°F (70°C).

8.2.2 A minimum of three specimens shall be tested. Whenever possible, one specimen shall be obtained from the upper third of the product, one from the middle, and one from the lower third, determined in the direction of the rising of the mass during manufacture. Otherwise, the position of the cubes and information regarding the rise shall be reported. The direction of the rise shall be noted on all specimens.

8.2.3 Loadbearing surfaces of the specimen shall be plane within 0.0035 in. (0.09 mm) per 4 in. (100 mm). This can be achieved by grinding, milling, or capping. When capping, a gypsum plaster compound shall be used.

8.3 *Procedure:*

8.3.1 The specimen shall be placed in the testing machine and the load applied perpendicular to the direction of rise during manufacture.

8.3.2 *Speed of Testing*—Apply the load up to one half of the expected maximum load at a convenient rate, after which adjust the controls of the machine as required to give a uniform rate of travel of the moving head such that the remaining load is applied in not less than one nor more than two minutes.

8.3.3 Calculate the compressive strength of each specimen as follows:

$$\text{Compressive strength, } f = \frac{P}{A} \quad (1)$$

where:

f = compressive strength of the specimen, psi (or Pa),
P = maximum load, lbf (or N), indicated by the testing machine, and
A = gross cross sectional area of the specimen, in.^{2} (mm^2).

8.4 The compressive strength shall be reported to the nearest 10 psi (69 kPa) for each specimen and as the average for three specimens.

9. Moisture Content and Bulk Density Test

9.1 *Apparatus:*

9.1.1 *Balance,* shall be sensitive within 0.5 % of the mass of the specimen.

9.2 *Test Specimens*—Three test specimens, as described in 8.2, shall be used for calculating the bulk density.

9.3 *Procedure:*

9.3.1 The mass of the specimens shall be determined and then dried in a ventilated oven at 212 to 230°F (100 to 110°C) for not less than 24 h, and until two successive determinations of mass at intervals of 2 h show an increment of loss not greater than 0.2 % of the last previously determined mass of the specimen.

9.3.2 Calculate the moisture content of each specimen as follows:

$$\text{Moisture content \%, } MC = (A - B)/B \times 100 \quad (2)$$

where:

MC = moisture content, %
A = sampled mass of specimen, lb (kg), and
B = dry mass of specimen, lb (kg).

9.3.2.1 Report the average moisture content of all of the specimens as the moisture content of the lot.

9.3.3 The dimensions of the test specimens are determined with a caliper gauge. The width and height are to be measured at the ends and in the middle of the length of the specimen. The length is measured on two opposite sides. The volume of the specimen is determined by multiplying the average values of the dimensions.

9.3.4 Calculate the dry bulk density of each specimen as follows:

$$\gamma = B/V \quad (3)$$

where:

γ = dry bulk density, lb/ft^3 (kg/m^3),
B = dry mass of specimen, lb (kg), and
V = volume of the specimen, ft^3 (m^3).