



Designation: C 1452 – 00

Standard Specification for Reinforced Autoclaved Aerated Concrete Elements¹

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1. Scope

1.1 This specification covers load-bearing and nonload-bearing reinforced autoclaved aerated concrete (AAC) floor, roof, wall, and stair elements used as components for building construction. Autoclaved aerated concrete 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. 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 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 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 with high accuracy into elements of various sizes. The elements then are steam-cured under pressure in autoclaves where the matrix is transformed into a solid calcium silicate hydrate.

NOTE 1—LOI up to 12 % may be acceptable for production of AAC provided supporting test data is presented by the manufacturer.

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

2. Referenced Documents

2.1 ASTM Standards:

A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement²

- C 22/C 22M Specification for Gypsum³
- C 33 Specification for Concrete Aggregates⁴
- C 144 Specification for Aggregate for Masonry Mortar⁵
- C 150 Specification for Portland Cement³
- C 332 Specification for Lightweight Aggregates for Insulating Concrete⁴
- C 595 Specifications for Blended Hydraulic Cements³
- C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete⁴
- C 1386 Specification for Precast Autoclaved Aerated Concrete (PAAC) Wall Construction Units⁵

3. Classification

3.1 Autoclaved aerated concrete elements manufactured in accordance with this specification are classified according to their strength class as shown in Table 1.

4. Materials and Manufacture

4.1 *Raw Materials*—Materials shall conform to the following specifications:

- 4.1.1 *Quicklime*, in accordance with manufacturer's specification.
 - 4.1.2 *Aggregate*, in accordance with Specification C 33, C 144, or C 332.
 - 4.1.3 *Portland Cement*, in accordance with Specification C 150.
 - 4.1.4 *Blended Cements*, in accordance with Specification C 595.
 - 4.1.5 *Gypsum*, in accordance with Specification C 22/C 22M.
 - 4.1.6 *Pozzolan*, in accordance with Specification C 618.
 - 4.1.7 Gas-producing agent conforming to the manufacturer's specification.
- 4.2 *Steel Reinforcing*—Steel reinforcing shall conform to the following specification and the requirements of Table 2.
- 4.2.1 *Steel Wire*, in accordance with Specification A 82.

¹ This specification is under the jurisdiction of ASTM Committee C-27 on Precast Concrete Products and is the direct responsibility of Subcommittee C27.60 on Precast Autoclaved Aerated Concrete.

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² *Annual Book of ASTM Standards*, Vol 01.04.

³ *Annual Book of ASTM Standards*, Vol 04.01.

⁴ *Annual Book of ASTM Standards*, Vol 04.02.

⁵ *Annual Book of ASTM Standards*, Vol 04.05.

TABLE 1 Physical Requirements

Strength Class	Minimum Compressive Strength of AAC, psi (MPa)		Nominal Dry Bulk Density, lb/ft ³ (kg/m ³)	Density Limits, lb/ft ³ (kg/m ³)	Average Drying Shrinkage (%)	Maximum Area of Steel Corrosion ^A (%)
	Average	Min				
AAC-2	360 (2.5)	290 (2.0)	25 (400) 31 (500)	22 (350)—28 (450) 28 (450)—34 (550)		
AAC-4	725 (5.0)	580 (4.0)	31 (500) 37 (600) 44 (700)	28 (450)—34 (550) 34 (550)—41 (650) 41 (650)—47 (750)	≤ 0.02	≤ 5.0
AAC-6	1090 (7.5)	870 (6.0)	37 (600) 44 (700) 50 (800)	35 (550)—41 (650) 41 (650)—47 (750) 47 (750)—53 (850)		

^A As determined according to Section 7, indicated by a slight trace of rust on the surface of the steel. No flaking or deep rust should be evident on the steel surface.

TABLE 2 Properties of Steel Reinforcement

Property	Minimum Characteristic Value
Yield strength, min, ksi (MPa)	70 (485)
Tensile strength, min, ksi (MPa)	80 (550)
Reduction of area, min, %	30 ^A

^A For material testing over 100 ksi (690 MPa) tensile strength, the reduction of area shall be not less than 25 %.

5. Physical Requirements

5.1 *Compressive Strength*—The compressive strength of the AAC material shall be determined according to Specification C 1386 and shall conform to the requirements of Table 1.

5.2 *Bulk Density*—The dry bulk density shall be determined according to Specification C 1386 and shall conform to the requirements of Table 1.

5.3 *Shrinkage*—The drying shrinkage of the AAC material shall be determined according to Specification C 1386 and shall conform to the requirements of Table 1.

5.4 *Weld-Point Shear Strength*—The weld-point shear strength in the reinforcement shall be determined in accordance with Section 8 and shall conform to the requirements of Table 3.

5.5 *Concrete Cover of Steel Reinforcement*—The minimum concrete cover over the steel reinforcement shall be 0.375 in. (10 mm). The reinforcing steel shall receive a rust-resistant coating before casting.

5.6 *Effectiveness of Corrosion Protection of Steel Reinforcement*—The effectiveness of the corrosion protection for the steel reinforcement shall be determined according to Section 7 and shall conform to the requirements of Table 1.

5.7 *Steel Reinforcement*—The properties of the steel reinforcement shall be determined in accordance with Specification A 82 and shall conform to the requirements of Table 2.

TABLE 3 Weld-Point Shear Strength

Diameter of the Longitudinal Reinforcement, in. (mm)	Minimum Shear Strength of the Joint, lbf (kN)
0.16 (4.0)	495 (2.20)
0.18 (4.5)	598 (2.66)
0.20 (5.0)	771 (3.43)
0.24 (6.0)	1113 (4.95)
0.28 (7.0)	1513 (6.73)
0.32 (8.0)	1987 (8.84)
0.35 (9.0)	2502 (11.13)
0.40 (10.0)	3091 (13.75)
0.43 (11.0)	3741 (16.64)
0.47 (12.0)	5339 (19.79)

5.8 The load-bearing capacity of the reinforced AAC elements shall be determined using the test method in Section 9, or by calculation provided adequate test data are available for verification of the calculation method.

6. Dimensions and Permissible Variations

6.1 The dimensions of the reinforced elements shall be as specified by the AAC manufacturer. The allowable deviations for the element dimensions shall be as specified in Table 4.

7. Corrosion Protection of Steel Reinforcement in AAC

7.1 Apparatus:

7.1.1 *Storage Container*, with dimensions sufficient to completely immerse AAC specimens.

7.2 Test Specimens:

7.2.1 A test set shall consist of six test specimens having the dimensions 16 in. (400 mm) by width of the reinforced element by thickness of the reinforced element. The exposed surface areas of the steel reinforcement at each end of the test specimen shall be coated with the corrosion-protection compound and allowed to dry before testing. Three specimens are to be kept as reference specimens, and three specimens shall be tested.

7.3 Procedure:

7.3.1 *Reference Specimens*—The reference specimens are stored in a room having a temperature of 59–68°F (15–20°C) and a relative humidity of 50 to 70 %.

7.3.2 *Test Specimens*—The test specimens are immersed in an aqueous sodium chloride solution, 3 % NaCl by mass, for periods of 2 h at intervals of three days. This is repeated for a total of ten test cycles. When the specimens are not immersed in the sodium chloride solution, they are stored under the same conditions as the reference specimens. After completion of the ten testing cycles the specimens are allowed to air dry for 4 h.

7.3.3 *Inspection for Rust*—After completion of the testing procedure the autoclaved aerated concrete around the steel reinforcing is removed from both the reference and the test specimens. The area of rust covering the steel is determined by

TABLE 4 Dimensional Tolerances for AAC Reinforced Elements

Dimension	Floor, Roof, and Wall Panels
Length	± 0.20 in. (± 5 mm)
Width	± 0.12 in. (± 3 mm)
Thickness	± 0.12 in. (± 3 mm)
Tongue/groove alignment	± 0.12 in. (± 3 mm)