

Architectural Cast Stone		
Minimum Compressive Strength (psi)	Maximum Cold Water Absorption (% Weight)	Maximum Boiling Water Absorption (% Weight)
6,500	6	10

**Figure 4-4** Minimum physical requirements for architectural cast stone (based on ASTM C1364).

#### 4.4 AUTOCLAVED AERATED CONCRETE BLOCK

Block made from autoclaved aerated concrete (AAC) has excellent insulating, sound-damping, and fire-resistive properties (*Fig. 4-5*). A 4-in.-thick wall has a fire rating of 4 hours and a 6-in. wall has a 6-hour rating. *R* values are higher than for any other type of masonry. Compressive strength is relatively low, however, and moisture absorption high. The exterior surface must be protected from wetting by a cladding (such as stucco) or breathable acrylic coating (minimum 5 perms). The units weigh only one-fourth to one-third as much as normal concrete block, but not because of lightweight aggregates. The mix contains portland cement, lime, sand or fly ash, and aluminum powder, with water added to form a slurry. Large steel vats are used as molds. A chemical reaction releases hydrogen gas and generates heat, which causes the concrete to expand and set in cellular form. Smaller units are wire-cut or saw-cut from the large forms and curing is completed under steam pressure in autoclave kilns.

AAC block has little size variation, so it can be laid with standard  $\frac{3}{8}$ -in. mortar joints or with joints that are only  $\frac{1}{8}$  in. thick. It can be used for bearing walls in low-rise construction, for interior partition walls, as lightweight fireproofing for steel structural frames, and as acoustical partitions. AAC block can be cut or sawed with ordinary woodworking tools and is also nailable. Two ASTM standards for AAC have been published, and others are in development. ASTM C1386, *Specification for Precast Autoclaved Aerated Concrete (PAAC) Wall Construction Units*, and ASTM C1452, *Specification for Reinforced Autoclaved Aerated Concrete Elements*, cover both physical properties and testing methods.

#### 4.5 CONCRETE BLOCK

Of the cementitious masonry products marketed in this country, concrete block is the most familiar and most widely used. Aggregates determine the weight of the block and give different characteristics to the units. Lightweight aggregates reduce the weight by as much as 20 to 40% with little or no sacrifice in strength. Specifications for aggregates are covered in ASTM C33, *Standard Specification for Concrete Aggregates*, and ASTM C331, *Standard Specification for Lightweight Aggregates for Concrete Masonry Units*. Weight classifications are based on density of the concrete and are subdivided as follows: normal-weight units are those whose concrete mix weighs 125 lb/cu ft or more; medium-weight, between 105 and 125 lb/cu ft; and lightweight, less than 105 lb/cu ft.

Some of the more commonly used aggregates are listed in *Fig. 4-6* along with the concrete unit weight and weight classifications. Exact individual unit weights depend on the coring design of the block and the percentage of solid volume and voids. An ordinary  $8 \times 8 \times 16$ -in. unit weighs more than 40 lb when made from the more dense aggregates, and 25 to 35 lb when made from the lighter aggregates. Manufacturers can supply information regarding exact weight of their products, or the figures may be calculated if the percent of solid volume is known. Both heavy and lightweight block can be used in any

Typical Properties of AAC Block						
AAC Strength Class	Compressive Strength (psi)	Density (pcf)	R-Value for Thickness Listed			
			6 in.	8 in.	10 in.	12 in.
AAC2	360	25	7.59	10.13	12.66	15.19
		31	6.25	8.33	10.42	12.50
AAC5	725	31	5.22	6.96	8.70	10.43
		37				
		44				
AAC6	1090	50	5.22	6.96	8.70	10.43
		37				
		44				
		50				

Figure 4-5 Properties of autoclaved aerated concrete block.

Effect of Aggregate on Weight and Physical Properties						
Classification	Aggregate	Unit Weight of Concrete (pcf)	Average Weight of 8 x 8 x 16 Unit (lb)	Net Area Compressive Strength (psi)	Water Absorption (lb/cu.ft of concrete)	Thermal Expansion Coefficient (per °F x 10 <sup>-4</sup> )
Normal weight	Sand and gravel	135	38	2200-3400	7-10	5.0
	Crushed stone	135	38	2000-3400	8-12	5.0
Medium weight	Air-cooled slag	120	34	2000-2800	10-15	4.6
Light weight	Coal cinders	95	27	1300-1800	12-18	2.5
	Expanded slag	95	27	1300-2200	12-16	4.0
	Scoria	95	27	1300-2200	12-16	4.0
	Expanded clay, shale, and slate	85	24	1800-2800	12-15	4.5
	Pumice	75	22	1300-1700	13-18	4.0

Average Weight of Concrete Masonry Units (lbs.)							
Nominal Size (in.)	Concrete Density (pcf)						
	80	90	100	110	120	130	140
4 x 8 x 16	14.5	16.5	18.0	20.0	22.0	23.5	25.5
6 x 8 x 16	17.0	19.0	21.5	23.5	25.5	27.5	30.0
8 x 8 x 16	22.5	25.0	28.0	30.5	33.5	36.0	39.0
10 x 8 x 16	27.5	31.0	34.5	37.5	41.0	44.5	48.0
12 x 8 x 16	31.0	35.0	39.0	43.0	47.0	50.5	54.5

Figure 4-6 CMU aggregate type, unit weight, and unit properties.

type of construction, but lightweight units have higher fire, thermal, and sound resistance. Choice of unit will depend largely on local availability and project design requirements. Two kinds of concrete block are recognized—ASTM C90, *Standard Specification for Loadbearing Concrete Masonry Units*, and ASTM C129, *Standard Specification for Non-Loadbearing Concrete Masonry Units*.