Unit	Minimum Compressive Strength (psi)		Maximum Water Absorption (pcf), Average of 3 Units, Weight Classification—Oven Dry Weight of Concrete		
	Average of 3 Units	Individual Unit	Lightweight (less than 105 pcf)	Medium Weight (105 to 125 pcf)	Normal Weight (125 pcf or more)
Loadbearing CMU (ASTM C90)	1900 (net area)	1700 (net area)	18	15	13
Non-Loadbearing CMU (ASTM C129)	600 (net area)	500 (net area)	—	—	—
Concrete Brick (ASTM C55)					
Grade N	3500 (gross area)	3000 (gross area)	15	13	10
Grade S	2500 (gross area)	2000 (gross area)	18	15	13
Calcium Silicate Brick (Sand Lime Brick) (ASTM C73)					
Grade SW	4500 (gross area)	3500 (gross area)	—	—	10
Grade MW	2500 (gross area)	2000 (gross area)	—	—	13

Figure 4-21 Strength and absorption requirements for concrete masonry units. (*Copyright ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428. Reprinted with permission.*)

change can be reduced by as much as half by using high-pressure autoclave curing methods as opposed to low-pressure steam curing.

Small dimensional variations may occur as a result of changes in temperature. These changes, however, are fully reversible, and the units return to their original size after being heated and cooled through the same temperature range. Coefficients of thermal expansion vary with different aggregates and are generally greater than values for clay masonry. As a result, provisions must be made for flexible anchorage and pressure-relieving control joints to prevent random cracking.

Volume changes are also caused by a natural chemical reaction called carbonation. Cured concrete absorbs carbon dioxide from the air, causing irreversible shrinkage. Under certain conditions, the magnitude of this change may nearly equal that of moisture shrinkage. Carbonation stages added to the normal manufacturing process can eliminate many field problems by effectively "preshrinking" the masonry and producing a more dimensionally stable unit.

4.7.4 Fire, Sound, and Heat Resistance

Fire resistance, thermal insulation, and acoustical characteristics are all related to the density of the product. *Fire-resistance* ratings are based on the rate of heat transmission through the unit and the rate of temperature rise on the opposite face rather than on structural failure because no such failure occurs. Ratings are calculated on the equivalent solid thickness of the unit exclusive of voids. For some aggregates and core designs, maximum 4-hour ratings can be obtained with 8-in. hollow units. *Thermal insulation* characteristics vary with aggregate type and density. Exact values may be easily determined from basic information. (Insulating qualities based on engineering calculations are discussed in Chapter 8.)

Acoustical characteristics may be subdivided into two categories: (1) sound absorption and reflectance, which depend primarily on surface texture, and

(2) sound transmission, which is a function of density and mass. Normal-weight or heavyweight units have higher resistance to sound transmission. They will produce walls with higher STC ratings than those of lightweight units because of their resistance to diaphragm action. Sound absorption is higher for coarse, open-textured surfaces with large pores. Sound reflectance is greater for tighter, closer-grained, or painted surfaces with few, if any, open pores. CMUs can absorb from 18 to 68% of the sound striking the face of the wall, with lightweight units having the higher values. Specially designed blocks with slotted face shells provide high absorption by permitting sound waves to enter the cores, where their energy is absorbed by fiber inserts or dissipated through internal reverberation. Noise problems, particularly of middle- and high-frequency sounds, can often be controlled by these units, but they are proprietary products and may not be available in all locations.

4.7.5 Colors

CMU unit colors may be altered through the use of different aggregates, cements, or the integral mixing of natural or synthetic pigments (refer to Chapter 2). Pearl grays, buffs, tans or even whites can easily be produced, offering great versatility within the generic product group. Penetrating stains may also be applied to the finished wall to achieve a uniform color.