

burned to vitrification to close all pores, and sufficiently rough in texture to ensure complete and intimate bond with the mortar. Conditions of temperature and acidity and the absorption rate of the unit are the primary factors governing material selection for use in corrosive environments. Determination of the nature and severity of exposure will dictate which of the three types of units covered in ASTM C279, *Standard Specification for Chemical-Resistant Masonry Units*, should be used. Type I has low absorption (6%) and high sulfuric acid resistance. Type II has lower absorption (4%) and higher acid resistance. Type III has minimum absorption (1%) and maximum acid resistance. The three types do not differ significantly in thermal shock resistance. Chemical-resistant brick performs satisfactorily in the presence of mild alkalis and all acids except hydrofluoric. In instances where strong alkalis or hydrofluoric acid and its salts are present, a special "carbon brick" is required. Chemical-resistant mortars must be used with these units to assure effective performance (see Chapter 6).

ASTM C32, *Standard Specification for Sewer and Manhole Brick*, identifies two grades for each usage. For *sewer brick*, Grades SS and SM distinguish between the amounts and velocities of abrasive materials carried. Grade SS is lower in absorption and offers greater erosion resistance. *Manhole brick* is graded on its ability to withstand freezing action rather than abrasion. Grade MS provides a high and uniform degree of resistance, while Grade MM offers only moderate and nonuniform resistance. These bricks may be used in drainage structures for the conveyance of sewage, industrial wastes, and storm water, and for related structures such as manholes and catch basins.

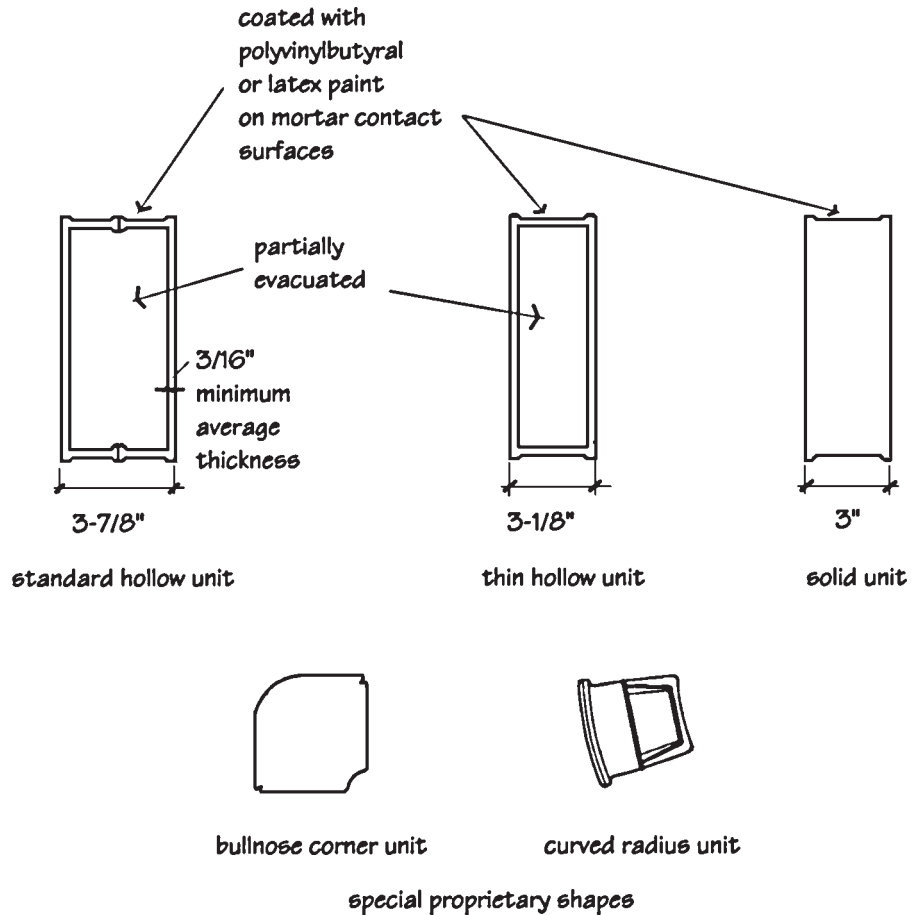
### 3.1.4 Glass Block

Glass block can be used as security glazing, or to produce special daylighting effects. Glass block is considered a masonry material since it is laid up in cement mortar and uses the same type of joint reinforcement as other units. Although they are not made from clay, glass blocks do share some common characteristics with burned clay products. Both contain silicates as a primary raw ingredient, and the glass units, like brick, undergo vitrification when subjected to a heat process. They are available in a variety of sizes, and in both solid and hollow form (see Fig. 3-16). Decorative blocks are produced in clear, reflective, or color glass with smooth, molded, fluted, etched, or rippled texture. Functionally, glass block is used to diffuse or direct light for different illuminating requirements and provide a high level of security and energy efficiency for glazed areas. Compressive strengths range from 400 to 800 psi.

Most glass block is made of clear, colorless glass that admits the full spectrum of natural light (see Fig. 3-17). Hollow block with patterns pressed into the interior face partly or totally distorts images, creating visual privacy. Units made with glass fiber inserts reduce glare and brightness. Other units diffuse or reflect light. Glass blocks can increase or reduce solar heat gain, and because of their large air cavity, hollow blocks have greater thermal resistance than ordinary flat glass (see Fig. 3-17). A partial vacuum created when the hollow units are made further improves their thermal resistance.

Solar reflective block is coated with a heat-bonded oxide which can reduce solar heat gain by as much as 80% compared with conventional  $\frac{1}{8}$ -in. flat glass (see Fig. 3-18). Glass fiber inserts further reduce solar heat gain by about 5%, and also increase thermal resistance.

Glass block comes in nominal face sizes of  $6 \times 6$ -,  $8 \times 8$ -, and  $12 \times 12$ -in. square units and  $4 \times 8$ - and  $6 \times 8$ -in. rectangular units. Actual dimensions



**Figure 3-16** Glass block sizes and shapes.

vary by manufacturer and style. Units made in the United States are  $\frac{1}{4}$ -in. less than nominal dimensions. Most hollow blocks are  $3\frac{3}{8}$  in. thick (nominal 4 in.), but some manufacturers also make thin blocks which measure only  $3\frac{1}{8}$  in. and weigh 20% less than standard units. Solid glass blocks are used for high-security glazing. They come in  $3 \times 8$ -in. rectangular units and  $8 \times 8$ -in. square units. Ordinary construction methods require limiting the number of courses laid at one time so that fresh mortar is not extruded from the joints by the weight of the block. There are several proprietary types of spacers that help speed construction. Unit weight is transferred directly from block to block by the spacers, allowing work to progress rapidly without waiting for substantial mortar cure to support the weight of the units. Mortar adhesion to glass block is limited.

### 3.2 STRUCTURAL CLAY TILE

Structural clay tile is the most recently developed of clay masonry products, first produced in this country in 1875. Up until that time, most buildings were constructed with solid loadbearing masonry walls. With the invention and mastery of cast iron and steel structural framing, a need arose for lightweight backing materials for the facing masonry used to clad these