TEK 02-01B

TYPICAL SIZES AND SHAPES OF CONCRETE MASONRY UNITS

INTRODUCTION

Concrete masonry is one of the most versatile building products available because of the wide variety of appearances that can be achieved using concrete masonry units. Concrete masonry units are manufactured in different sizes, shapes, colors, and textures to achieve a number of finishes and functions. In addition, because of its modular nature, different concrete masonry units can be combined within the same wall to achieve variations in texture, pattern, and color.

Certain concrete masonry sizes and shapes are considered standard, while others are popular only in certain regions. Local manufacturers can provide detailed information on specific products, or the feasibility of producing custom units.

UNIT SIZES

Typically, concrete masonry units have nominal face dimensions of 8 in. (203 mm) by 16 in. (406 mm), available in nominal thicknesses of 4, 6, 8, 10, 12, 14, and 16 in. (102, 152, 203, 254, 305, 356, and 406 mm). Nominal dimensions refer to the module size for planning bond patterns and modular layout with respect to door and window openings. Specified 3 dimensions of concrete masonry units are typically /8 in. (9.5 mm) less than nominal dimensions, so that a 4 or 8 in. (102 3 or 203 mm) module is maintained with /8 in. (9.5 mm) mortar joints. Figure 1 illustrates nominal and specified dimensions for a nominal 8 x 8 x 16 in. (203 x 203 x 406 mm) concrete masonry unit. In addition to these standard sizes, other unit heights, lengths, and thicknesses may be available from local concrete masonry producers.

Standard Specification for Loadbearing Concrete Masonry Units, ASTM C90 (ref. 1) is the most frequently referenced standard for concrete masonry units. ASTM C90 includes minimum face shell and web thicknesses for the different sizes of concrete masonry units as listed in Table 1. Overall unit dimensions (width, height, and length) are permitted to vary 1 by ± / in. (3.2 mm) from the specified dimensions. Where 8 required, units may be manufactured to closer tolerances than those stipulated by ASTM C90. ASTM C90 also

defines the difference between hollow and solid concrete masonry units. The net cross-sectional area of a solid unit is at least 75% of the gross cross-sectional area.

In addition to the unit sizes above, concrete brick complying with ASTM C1634, Standard Specification for Concrete Facing Brick (ref. 2), are available in a wide array of nominal lengths and heights; typically with a nominal 4 in. (102 mm) width for veneer applications. Concrete brick may be 100% solid or cored, provided that the cored area of the brick does not exceed 25% of the gross cross-sectional area.

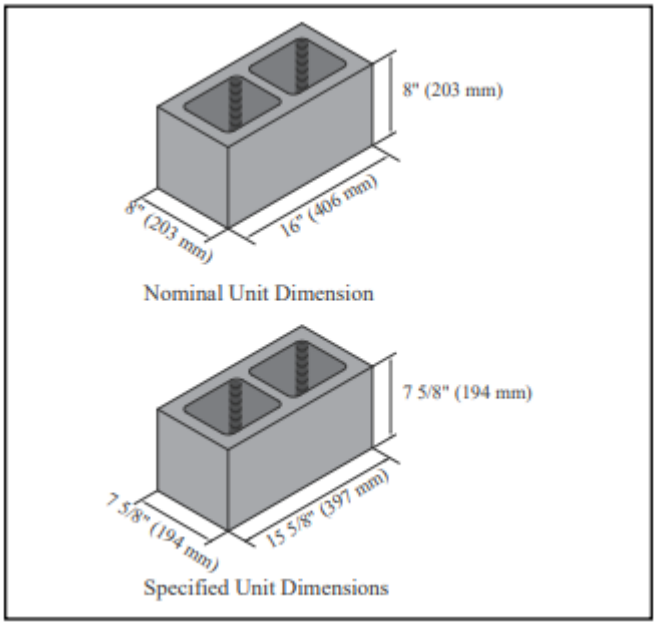

Figure 1—Nominal and Specified Unit Dimensions

Nominal Width (*W*) of Units, in. (mm)	Face Shell Thickness (t_{fs}), minimum, in. (mm) [B,C]	Webs	
		Web Thickness[C] (t_w), minimum, in. (mm)	Normalized Web Area (A_{nw}), minimum, in.²/ft² (mm²/m²)[D]
3 (76.2) and 4 (102)	3/4 (19)	3/4 (19)	6.5 (45,140)
6 (152)	1 (25)	3/4 (19)	6.5 (45,140)
8 (203) and greater	1 1/4 (32)	3/4 (19)	6.5 (45,140)

[A] Average of measurements on a minimum of 3 units when measured as described in Test Methods C140/C140M (ref. 3).
[B] For units having split surfaces, a maximum of 10% of the split surface is permitted to have a face shell thickness less than those shown, but not less than 3/4 in. (19 mm). When the units are to be solid grouted, the 10 % limit does not apply and Footnote [C] establishes a thickness requirement for the entire face shell.
[C] When the units are to be solid grouted, minimum face shell and web thickness shall not be less than 5/8 in. (16 mm).
[D] Minimum normalized web area does not apply to the portion of the unit to be filled with grout. The length of that portion shall be deducted from the overall length for the calculation of the minimum web cross-sectional area.

Table 1--Minimum Face Shell and Web Requirements

UNIT SHAPES

Concrete masonry unit shapes have been developed for a wide variety of applications. Some common unit configurations are shown in Figure 2. Typically, the face shells and webs are tapered on concrete masonry units. Depending on the core molds used in the manufacture of the units, face shells and webs may be tapered with a flare at one end, or may have a straight taper from top to bottom. The taper provides a wider surface for mortar and easier handling for the mason.

Open-ended units allow the units to be threaded around reinforcing bars. This eliminates the need to lift units over the top of the reinforcing bar, or to thread the reinforcement through the masonry cores after the wall is constructed. Bond beams in concrete masonry walls can be accommodated either by saw-cutting a portion of the webs out of a standard unit, or by using bond beam units. Bond beam units are either manufactured with reduced webs or with "knock-out" webs, which are removed prior to unit placement in the wall. Horizontal bond beam reinforcement is easily accommodated in these units. Lintel units are similar to bond beam units except the bottom of the unit is solid to confine grout to the lintel. Lintel units are available in various depths to carry appropriate lintel loads over door and window openings. Sash block have a vertical groove molded into one end to accommodate a window sash. Sash block can be laid with the grooves adjacent to one another to accommodate a preformed control joint gasket. An all-purpose or kerf unit contains two closely spaced webs in the center, rather than the typical single web. This allows the unit to be easily split on the jobsite, producing two 8 in. (203 mm) long units, which are typically used adjacent to openings or at the ends or corner of a wall.

Figure 3 shows units developed for specific wall applications. Control joint units are manufactured with one male and one female end to provide lateral load transfer across control joints. Bull-nosed units are available with either a single or double bull nose, to soften corners. Screen units are available in many sizes and patterns (ref. 4). Typical applications include exterior fences, interior partitions, and openings within interior concrete masonry walls. Bevelled-end units, forming a 45° angle with the face of the unit, are used to form walls intersecting at 135° angles. Units in adjacent courses overlap to form a running bond pattern at the corner. Pilaster and column units are used to easily accommodate a wall-column or wall- pilaster interface, allowing space for vertical reinforcement in the hollow center.

A variety of concrete masonry units are designed to increase energy efficiency. These units, examples of which are shown in Figure 4, may have reduced web areas to reduce heat flow through the webs. Web areas can be reduced by reducing the web height or thickness, reducing the number of webs, or both. In addition, the interior face shell of the unit can be made thicker than a typical face shell for increased thermal storage, and hence further increase energy efficiency. Insulating inserts can also be incorporated into standard concrete masonry units to increase energy efficiency.

Acoustical units (Figure 5) dampens sound, thus improving the noise reduction attributes of an interior space. Acoustical units are often used in schools, industrial plants, and churches, and similar applications where improved internal acoustics are desired.

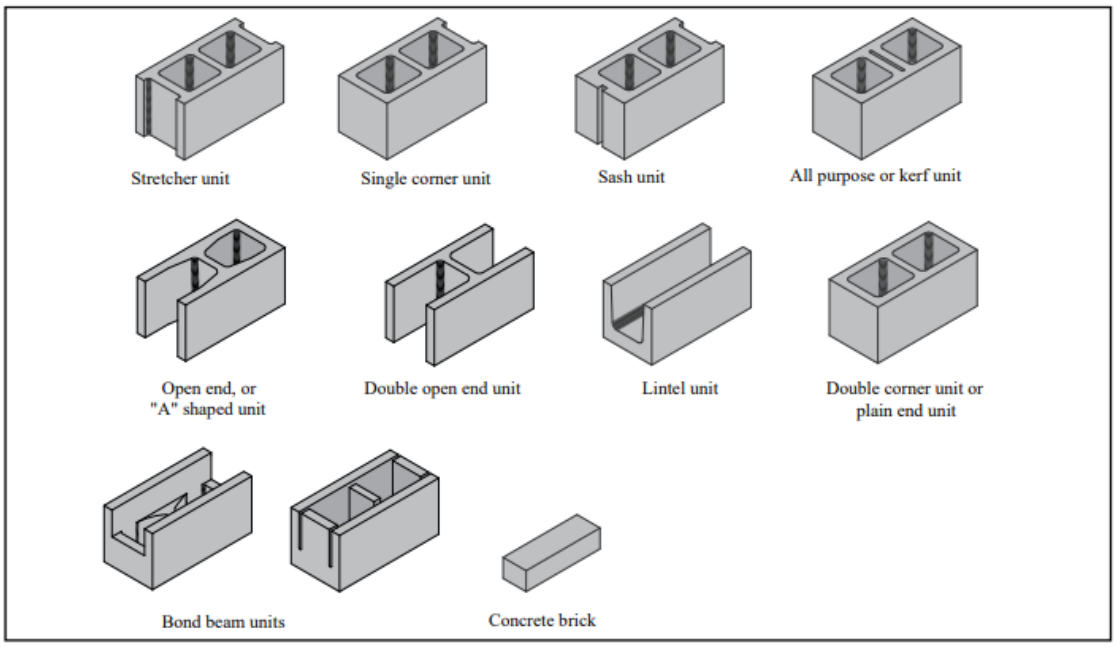

Figure 2–Typical Concrete Masonry Units

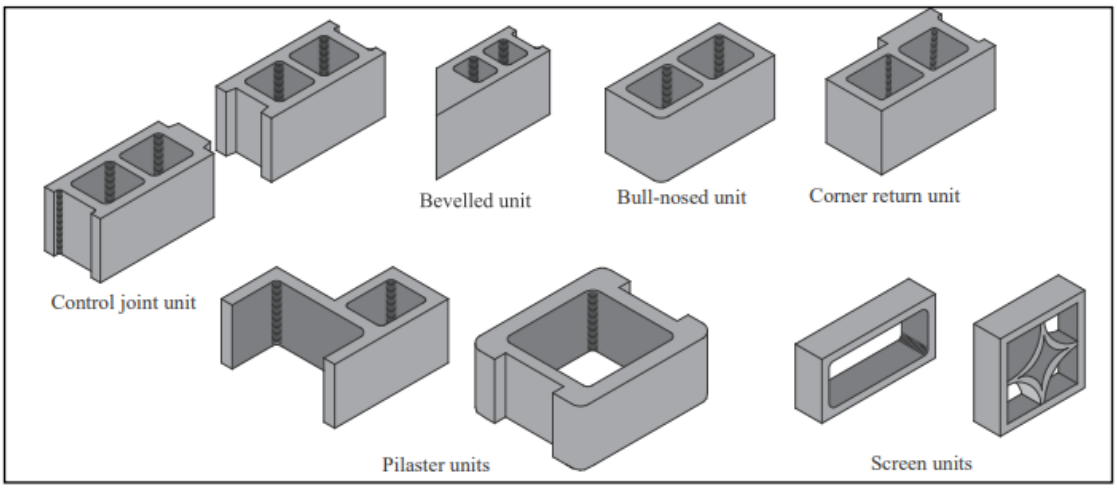

Figure 3–Special Unit Sapes

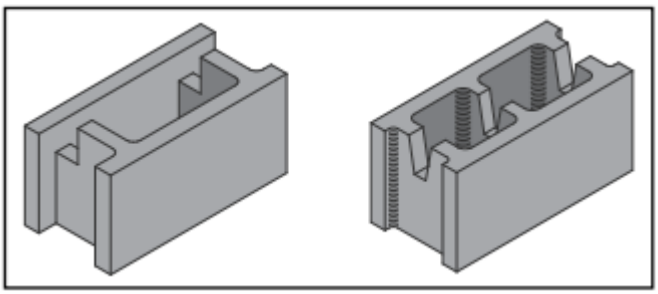

Figure 4–Examples of Concrete Masonry Units Designed for Energy Efficiency

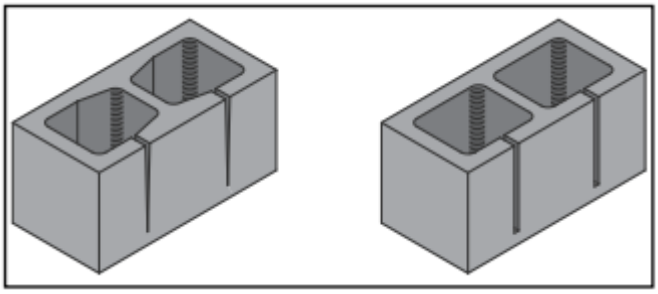

Figure 5–Examples of Acoustical Concrete Masonry Units

SURFACE FINISHES

The finished appearance of a concrete masonry wall can be varied with the size of units, shape of units, color of units and mortar, bond pattern, and surface finish of the units. The various shapes and sizes of concrete masonry units described above are often available in a choice of surface finishes. Some of the surfaces are molded into the units during the manufacturing process, while others are applied separately.
For more information on architectural surface finishes, see **TEK 2-3A Architectural Concrete Masonry Units** (ref. 5).

NOTATIONS

A_{nw} = Normalized web area, in. $^2/ft_2$ (mm^2/m^2)
t_{fs} = Minimum face shell thickness, in. (mm)
t_w = Minimum web thickness, in. (mm)
W = Nominal unit width, in. (mm)

References

1. Standard Specification for Loadbearing Concrete Masonry Units, ASTM C90-16, ASTM International, 2016.

2. Standard Specification for Concrete Facing Brick, ASTM C1634-15, ASTM International, 2015.

3. Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units, ASTM C140/C140M-16, ASTM International, 2016.

4. Concrete Masonry Screen Walls, TEK 3-16A, National Concrete Masonry Association, 2016.

5. Architectural Concrete Masonry Units, TEK 2-3B, National Concrete Masonry Association, 2017.

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Keywords

architectural units | bond beams | concrete brick | dimensions | equivalent thickness | lintels | screen block | sizes and shapes