



Gary Porter, Engineering & Technical Services for the Masonry Advisory Council is called upon with questions about construction concerns and for masonry advice from a variety of Architects, Engineers, Contractors, Developers and Distributor sources. He is dedicated to ongoing education of masonry and shares helpful tips from his professional experience that may be beneficial to you.

September 2018

Fire Rating for Masonry Walls

A popular question to the Masonry Advisory Council is “What is the fire rating of my masonry wall?” or “Where can I find the fire rating of my masonry wall?” The short answer to this problem is to pick up the phone, call your brick or block manufacturer and ask them. The manufacturer will know the fire rating on their masonry units. We all have the ability to google this and you might find the answer, but it is a little confusing.

The local building codes dictate the fire rating, which is the time that the elements, components or assembly of the wall hold up to maintain the ability to confine the fire, which equates to safety for occupants of a room. If the fire rating is actually 2 hours and 25 minutes, it is classified as a 2 hour rated wall. The longest fire rating for a masonry wall is 4 hours. A typical 8” cmu is rated at 2 hours.

The Brick Industry Association (BIA) at their website www.gobrick.com has a technical note #16 - Fire Resistance of Brick Masonry that explains in detail the what and how of determining fire ratings. In this technical note there are some tables listed with various wall assembly and elements of a masonry wall and their fire rating. This is a good source and helpful if the exact wall you need the fire rating for is described.

TABLE 1
Fire Resistance Ratings (Periods) for Various Walls and Partitions

Material	Item Number	Construction	Minimum Finished Thickness, Face-to-Face, in. (mm)			
			4 hr	3 hr	2 hr	1 hr
1. Brick of clay or shale ²	1-1.1	Solid brick of clay or shale ¹	6.0 (152)	4.9 (124)	3.8 (97)	2.7 (69)
	1-1.2	Hollow brick, not filled	5.0 (127)	4.3 (109)	3.4 (86)	2.3 (58)
	1-1.3	Hollow brick unit wall, grouted solid or filled with perlite vermiculite or expanded shale aggregate	6.6 (168)	5.5 (140)	4.4 (112)	3.0 (76)
	1-2.1	4 in. (102 mm) nominal thick units at least 75 percent solid backed with hat-shaped metal furring channel ¼ in. (76 mm) thick formed from 0.021 in. (0.53 mm) sheet metal attached to the brick wall at 24 in. (610 mm) o.c. with approved fasteners, and ½ in. (12.7 mm) Type X gypsum wallboard attached to the metal furring strips with 1 in. (25.4 mm) long Type S screws spaced at 8 in. (203 mm) o.c.	—	—	5 ³ (127)	—
2. Combination of clay brick and loadbearing hollow clay tile ²	2-1.1	4 in. (102 mm) solid brick and 4 in. (102 mm) tile (at least 40 percent solid)	—	8 (203)	—	—
	2-1.2	4 in. (102 mm) solid brick and 8 in. (203 mm) tile (at least 40 percent solid)	12 (305)	—	—	—
15. Exterior or interior walls ^{4,5,6}	15-1.5 ⁷	2¼ × 3¼ in. (57 × 95 mm) clay face brick with cored holes over ½ in. (12.7 mm) gypsum sheathing on exterior surface of 2 × 4 in. (51 × 102 mm) wood studs at 16 in. (406 mm) o.c. and two layers ½ in. (15.9 mm) Type X gypsum wallboard on interior surface. Sheathing placed horizontally or vertically with vertical joints over studs nailed 6 in. (152 mm) on center with 1¼ in. (44 mm) by No. 11 gage by ⅞ in. (11.1 mm) head galvanized nails. Inner layer of wallboard placed horizontally or vertically and nailed 8 in. (203 mm) on center with 6d cooler or wallboard nails. Outer layer of wallboard placed horizontally or vertically and nailed 8 in. (203 mm) on center with 8d cooler or wallboard nails. All joints staggered with vertical joints over studs. Outer layer joints taped and finished with compound. Nail heads covered with joint compound. 0.035 in. (0.89 mm) (No. 20 galvanized sheet gage) corrugated galvanized steel wall ties ¼ × 6¼ in. (19.1 × 168 mm) attached to each stud with two 8d cooler or wallboard nails every sixth course of bricks.	—	—	10 (254)	—

For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is at least 75 percent of the gross cross-sectional area measured in the same plane.

Thickness shown for brick and clay tile are nominal thicknesses unless plastered, in which case thicknesses are net. Thickness shown for clay masonry is equivalent thickness defined by Equation 3. Where all cells are solid grouted or filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, the equivalent thickness shall be the thickness of the brick using specified dimensions. Equivalent thickness may also include the thickness of applied plaster and lath or gypsum wallboard, where specified.

Shall be used for non-bearing purposes only.

Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.

For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and pre type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with a minimum of ⅜ in. (1.6 mm) gypsum veneer plaster.

For properties of cooler or wallboard nails, see ASTM C514, ASTM C547 or ASTM F1667.

The design stress of studs shall be reduced to 78 percent of allowable F_c with the maximum not greater than 78 percent of the calculated stress with studs having a slenderness ratio l/d of 33.



Fire Rating on Masonry Walls (cont.)

Usually, the wall assembly that you need to find the fire rating for is not in a table or it is not an Underwriters Laboratory, UL Fire Resistance Directory rated wall. If this is the case, something called the equivalent thickness method is used. The equivalent thickness method for calculating a fire rating is based on the mass and thickness of a masonry unit. There is an equation that describes this and the equivalent thickness of a single wythe unit or a combination of units in a wall assembly will yield the equivalent thickness calculated number, which translates via the table the fire rating of the unit or assembly.

$$Te = Vn / LH \text{ Eq. 3}$$

where:

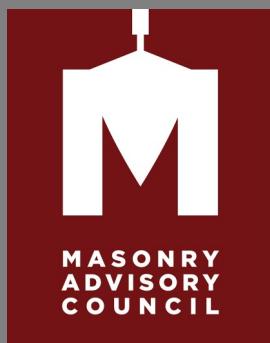
Te = equivalent thickness of the masonry unit, in.

Vn = net volume of the masonry unit, in.³

L = specified length of the masonry unit, in.

H = specified height of the masonry unit, in.

In summary, the fire rating of a masonry unit is usually found in a table, but most likely the equation can be used to find the equivalent thickness of a masonry unit and that value can determine the fire rating via a table.



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