

# MASONRY FIRE-RESISTANCE-RATED CONSTRUCTION CODE REFERENCES

- 2010 CBC – Chapter 7

## DEFINITIONS:

Section 702 | **FIRE-RESISTANCE RATING.** The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

## FIRE-RESISTANCE RATINGS:

Section 703.2 | **Fire-resistance ratings.** The fire-resistance rating shall be determined by testing per ASTM E 119, or in accordance with Section 703.3.

Section 703.3(2.) | **Alternative methods for determining fire resistance.** Fire resistance may be established by prescriptive designs of fire-resistance-rated building elements per Section 720 [Prescriptive Fire Resistance].

Section 703.3(3.) | Fire resistance may be established by calculations per Section 721 [Calculated Fire Resistance].

## PENETRATIONS:

Section 706.7 | **Combustible framing in fire walls.** Combustible members entering into a masonry fire wall from opposite sides shall not have less than a 4-inch distance between embedded ends; hollow units shall be solidly filled the width of the wall and 4 inches around the embedded members with noncombustible, approved fireblocking.

Section 713.3.1(1) | **Through penetrations.** If the penetrating item is steel, ferrous or copper pipes, tube or conduits no larger than 6 inches in diameter, the annular space between the item and the fire-resistance-rated wall may be filled with concrete, grout, or mortar the full thickness of the wall or as required to maintain the fire-resistance rating. The opening through the wall cannot exceed 144 sq in.

## PRESCRIPTIVE FIRE RESISTANCE:

Section 720.1.2 | **Unit masonry protection.** Where unit masonry is used for the protection of steel columns, required ties must be embedded in the bed joints of the masonry.

Table 720.1(2)  
3-1.1 – 3-1.4

**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS**

Item Numbers	Construction	Min. Finished Thickness Face-to-Face <sup>b</sup> (in.)			
		4 hr	3 hr	2 hr	1hr
3-1.1 <sup>f,g</sup>	Expanded slag or pumice.	4.7	4.0	3.2	2.1
3-1.2 <sup>f,g</sup>	Expanded clay, shale or slate.	5.1	4.4	3.6	2.6
3-1.3 <sup>f</sup>	Limestone, cinders or air-cooled slag.	5.9	5.0	4.0	2.7
3-1.4 <sup>f,g</sup>	Calcareous or siliceous gravel.	6.2	5.3	4.2	2.8

- b. Thickness for concrete masonry is equivalent thickness defined in Section 721.3.1 [Calculated Fire Resistance]. 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 block using specified dimensions as defined in Chapter 21. Equivalent thickness may also include the thickness of applied plaster and lath or gypsum wallboard, where specified.
- f. The fire-resistance time period for concrete masonry units meeting the equivalent thicknesses required for a 2-hour fire-resistance rating, and having a thickness of not less than 7 5/8 inches is 4 hours when cores which are not grouted are filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, sand or slag having a maximum particle size of 3/8 inch.
- g. The fire-resistance rating of concrete masonry units composed of a combination of aggregate types or where plaster is applied directly to the concrete masonry shall be determined in accordance with ACI 216.1/TMS 0216. [Calculate combinations of aggregate types by linear interpolation.]

## CALCULATED FIRE RESISTANCE:

Section 721.3.1.1	<p><b>Concrete masonry. Equivalent thickness. Concrete masonry unit plus finishes.</b> The equivalent thickness of concrete masonry assemblies is the sum of the equivalent thickness of the cmu plus the equivalent thickness of finishes:</p> $T_{ea} = T_e + T_{ef} \quad \text{where: } T_e = \text{Equivalent thickness of cmu}^*$ $T_{ef} = \text{Equivalent thickness of finishes}$
721.3.1.2	*For partially grouted construction, $T_e$ is the cmu value as determined by ASTM C 140.
721.3.1.3	*For solid grouted construction, $T_e$ is the actual thickness of the unit.
721.3.1.4	*For airspaces and cells filled with loose-fill materials below, the equivalent thickness is the actual thickness of the hollow cmu: <ul style="list-style-type: none"><li>▪ Sand, pea gravel, crushed stone, or slag meeting ASTM C 33</li><li>▪ Pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash, or cinders meeting ASTM C 331</li><li>▪ Perlite meeting ASTM C 549</li><li>▪ Vermiculite meeting ASTM C 516</li></ul>
721.3.2.1	<p><b>Concrete masonry wall. Finish on nonfire-exposed side.</b> Concrete masonry walls and partitions with plaster or gypsum wallboard applied to the NON-fire-exposed side:</p> <p>Equivalent thickness of plaster or gypsum wallboard corrected by factor from Table 721.2.1.4(1) and added to the equivalent thickness of the masonry.</p> <p>That sum is used to determine the rating from Table 721.3.2.</p>
721.3.2.2	<p><b>Finish on fire-exposed side.</b> Concrete masonry walls and partitions with plaster or gypsum wallboard applied to the fire-exposed side:</p> <p>The time assigned to the finish per Table 721.2.1.4(2) is added to the rating for the concrete masonry alone, or to the sum of the concrete masonry and finish per 721.3.2.1.</p>
721.3.2.3	<p><b>Nonsymmetrical assemblies.</b> Where a wall may have no finish on one side, or different types of finishes on each side, perform calculations for each and use the lower value. Exterior walls with more than 5 feet of horizontal separation, only the interior side will be assumed to be the fire-exposed side.</p>
721.3.2.4	<p><b>Minimum concrete masonry fire-resistance.</b> Where the finish applied to a concrete masonry wall contributes to the fire-resistance rating, the masonry must provide at least half the total rating.</p>
721.3.4	<p><b>Concrete masonry lintels.</b> Fire-resistance ratings for lintels are based on the nominal thickness of the lintel and the minimum cover of the main reinforcing bars, per Table 721.3.4.</p>
721.3.5	<p><b>Concrete masonry columns.</b> Fire-resistance ratings for columns are based on the least plan dimension of the column, per Table 721.3.5.</p>
721.5.1.4.5	<p><b>Steel assemblies. Structural steel columns. Masonry protection.</b> For masonry protection of structural steel columns, the fire-resistance rating is determined by Equation 7-16 and its supporting tables.</p>
721.5.1.4.6	<p><b>Equivalent concrete masonry thickness.</b> The equivalent thickness of concrete masonry used to protect steel columns is per Table 721.5.1(5)</p>