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ARTICLE

Fire-Resistance-Rated Brick Veneer Exterior Walls

By Rick Thornberry, P.E., President The Code Consortium, Inc.

Even though an intense fire damaged this brick wall, the fire was categorically contained and the walls are worthy of testing for structural integrity and future use.

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Part 2 of a Two-Part Series

Introduction

Part 1 of this two-part series discussed the history of the new Items 15-2.1 through 15-2.4 incorporated into the 2009 IBC Table 720.1(2) Rated Fire-Resistance Periods for Various Walls and Partitions that describe the two types of nonbearing brick veneer exterior walls that provide one-hour and two-hour fire-resistance ratings. It also provided basic descriptions of these brick veneer exterior wall assemblies and discussed how they differ from the brick exterior wall assemblies specified in the source document for these four new items: ICBO Evaluation Service Report ER-5058.

This article, Part 2, documents the design details for the two types of brick veneer walls specified in Items 15-2.1 through 15-2.4: adhered thin brick veneers and anchored brick unit veneers, as well as specific code requirements applicable to their installation. It also discusses how to determine when the 2009 IBC requires a one-hour or two-hour nonbearing exterior wall and provides some specific examples. A bibliography is also provided at the end of this article.

II. Design Details

The following outlines the specific design details and specifications for the various components of both the adhered and anchored brick veneer exterior wall assemblies described in Items 15-2.1 through 15-2.4 of Table 720.1(2).

1. Adhered Veneers – Thin Veneer Brick Units
Minimum Thickness – ½ inch
Maximum Thickness – 1 ½ inches
ASTM C1088-07a Specification for Thin Veneer Brick Units
Made From Clay or Shale
Grade TBS or Better

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Features

2. Anchored Veneers – Brick Units
Minimum Thickness – 2-5/8 inches
ASTM C216-07a Specification for Facing Brick (Solid
Masonry Units Made From Clay or Shale)

3. Mortar – Type S

4. Portland Cement Plaster

5. Metal Lath
Minimum 3.4 pounds per square yard

6. Studs
Wood: Nominal 2 x 4
Steel: 3-5/8 inch No. 16 gauge
Maximum 24 inches on center for adhered thin veneer brick units
Maximum 16 inches on center for anchored brick unit veneer

7. Gypsum Wallboard
Minimum 5/8-inch thick Type X

8. Attachments/Fasteners
Metal Lath: Minimum 1-inch long No. 6 drywall screws at 6 inches on center
Gypsum Wallboard: Minimum 1-inch long No. 6 drywall screws at 12 inches on center for single layer walls
Gypsum Wallboard: Minimum 1-inch long No. 6 drywall screws at 24 inches on center for the first (inner) layer of a double layer wall face
Gypsum Wallboard: Minimum 1-5/8 long No. 6 drywall screws at 12 inches on center for the second (outer) layer of a double layer wall face

Click here to see Figure 1, which reproduces page 136 of the 2009 IBC containing Items 15-2.1 through 15-2.4, along with the complete list of Footnotes to Table 720.1(2) found on page 137)

For more specifications on the brick veneer units and more installation details, refer to *Section 1405 Installation of Wall Coverings* and *Chapter 21 Masonry* of the 2009 IBC, as well as Sections 6.1 through 6.3 of TMS 402/ACI 530/ASCE 5-08 Building Code Requirements for Masonry Structures. For more details on lathing and plastering, refer to *Section 2507 Lathing and Plastering*, *Section 2510 Lathing and Furring for Cement Plaster*, and *Section 2512 Exterior Plaster of the 2009 IBC*.

It is also important to note that Section 1404.2 of the IBC requires installation of a water-resistive barrier on the outside face of the studs. This section specifies attaching a minimum of one layer of No. 15 asphalt felt complying with ASTM D226 for Type 1 felt (or other approved material) to the studs or the sheathing with flashing as described in Section 1405.3 in a manner that provides a continuous water-resistive barrier behind the exterior wall veneer.

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Part 2 of a Two-Part Series

III. Building Applications

Where are one-hour and two-hour fire-resistance-rated exterior walls required by the 2009 IBC for nonbearing wall applications?

The architect/engineer/designer needs to be aware of the 2009 IBC fire-resistance rating requirements for nonbearing exterior walls when deciding on a brick veneer exterior wall assembly as noted in Items 15-2.1 through 15-2.4 of Table 720.1(2) (seen in Figure 1). Table 602 *Fire-Resistance Rating Requirements for Exterior Walls Based on Fire Separation Distance* specifies at what fire separation distance a specific fire-resistance rating is required for exterior walls of buildings.

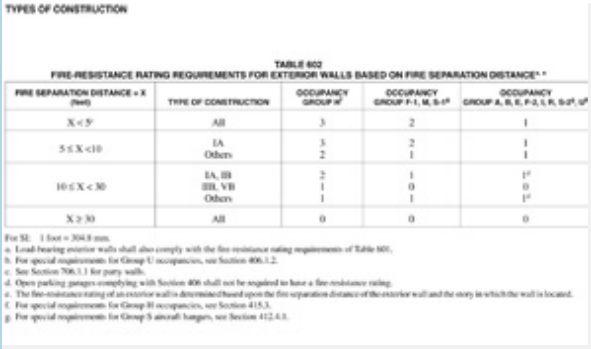
In order to apply this table properly, one needs to know what the Code says a "fire separation distance" represents. Section 702.1 Definition defines it as the distance measured from the building face to any one of the following:

1. The closest interior lot line
2. The centerline of a street, alley, or public way
3. An imaginary line placed between two buildings on the same property

This seems to be straightforward except on a couple of points. For example, what is the centerline of a public way? Section 1002.1 Definitions defines a "public way" as: "a street, alley, or other parcel of land open to the outside air leading to a street, that has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 10 feet."

And what is an imaginary line placed between two buildings on the same property? Consider the imaginary line to be the equivalent of an interior lot line for determining the fire separation distance. The Code leaves the location of that line up to the architect/engineer/designer for the buildings on the same property to determine. Once placed, it cannot be moved since it is meant to serve both buildings. Thus, the fire separation distance from one building to the imaginary line could be different from the distance from the other building. Generally, the imaginary line is placed to minimize the requirements for the fire-resistance ratings of the exterior walls and the opening protectives of the exterior wall openings in the buildings under consideration.

Figure 2: Table 602 of the 2009 IBC



TYPES OF CONSTRUCTION

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, e]

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H[d]	OCCUPANCY GROUP F-1, M, S-1[d]	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2[d], U[g]
X < 5	All	3	2	1
5 ≤ X <10	IA Others	3 2	2 1	1 1
10 ≤ X < 30	IA, IB IIB, VB Others	2 1 1	1 0 1	1[c] 0 1[c]
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.
a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
b. For special requirements for Group U occupancies, see Section 406.1.2.
c. See Section 706.1.1 for party walls.
d. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
e. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
f. For special requirements for Group H occupancies, see Section 415.3.
g. For special requirements for Group S aircraft hangars, see Section 412.4.1.

Figure 2: Click here to see Table 602 of the 2009 IBC.

Table 602 is reproduced as Figure 2 in this article (see below). Generally speaking, the predominant fire-resistance ratings in the table are one-hour and two-hour except for certain Group H occupancy buildings. All Group H occupancies with a fire separation distance of less than 5 feet are required to have a minimum three-hour fire-resistance rating, as are Group H occupancies of Type IA construction with a fire separation distance of less than 10 feet. Note that no fire-resistance ratings are required for any occupancies of any type of construction where the fire separation distance is at least 30 feet.

For specific applications for various occupancies and types of construction that fall within these boundaries, please refer to Table 602 in Figure 2. For example, an apartment house classified as a Group R-2 occupancy in a building of Type IIIA construction with a fire separation distance of 20 feet for one of the exterior walls would require that exterior wall to have a one-hour fire-resistance rating. If that same building were constructed of Type IIB or VB construction, no fire-resistance rating would be required for that wall. For another example, take a strip shopping center, which the Code classifies as a Group M occupancy constructed of Type IA construction with a fire separation distance of less than 10 feet. In that case, the wall with a fire separation distance of less than 10 feet would require a two-hour fire-resistance rating.

VII. Summary

Prescriptive one-hour and two-hour fire-resistance-rated exterior walls constructed with adhered thin veneer brick units or anchored brick units on steel or wood studs can now be found in Table 720.1(2) as Items 15-2.1 through 15-2.4 in the 2009 IBC for nonbearing wall assemblies. ICBO Evaluation Service ER-5058 previously recognized these prescriptive designs, and they have been used successfully since the mid-1990s in areas that previously utilized the ICBO Uniform Building Code. These designs can be used by architects/engineers/designers of building construction projects in those jurisdictions that adopt and enforce the IBC where the nonbearing exterior walls of a building are required to have a one-hour or two-hour fire-resistance rating in accordance with Table 602. The code presumes that these wall designs comply with the fire-resistance rating requirements of the table. For additional information, please contact the Western States Clay Products Association (WSCPA) at www.wscpa.us.

Click here for a list of documents referenced in this article.

Click here to read Part 1 of this article.

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