

ASTM E84 AND ASTM E136 TESTING FOR COMBUSTIBILITY, SMOKE AND FLAME SPREAD

Project specifications for exterior cladding materials often include language requiring the submission of documentation for testing conducted in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, and ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C*, in order to demonstrate safe performance in a fire.

Kiln-fired clay masonry—including brick, structural clay tile, glazed brick, and pavers—do not require testing to demonstrate compliance with ASTM E84 or ASTM E136 based on the following:

1. Brick masonry is an example of a “traditionally noncombustible material,” which means that no part of the material will ignite or burn when subjected to a fire. According to the National Fire Protection Association (NFPA), the definition of a noncombustible material in the building code changed in 1956. It was expanded to include products that “were not completely noncombustible, yet provided significant protection from fire,” such as gypsum board. However, the NFPA *Fire Protection Handbook* refers to brick as a “traditionally noncombustible material” that did not require this expanded definition for compliance.

Because of their demonstrated resistance to fire, clay masonry units frequently served as the primary

construction material for chimneys (residential and industrial), as well as provided fire protection to structural steel framing for buildings constructed in the early to mid-20th century (Figure 1). Clay brick are used, to this day, in fireplaces, chimneys, ovens, fire pits and similar applications.

2. Brick masonry does not contain any fuel that is necessary for combustion to occur. A fire must have fuel to burn, and fuel consists of organic content. For clay masonry, the kiln-firing process (Photo 1) literally burns any existing organic matter out of the raw material that becomes the brick. The Scope section of all ASTM specifications for clay masonry indicates that the product must be subjected to firing and references ASTM C1232, *Standard Terminology for Masonry*, which indicates the following:

firing, v – process of heating the material to elevated temperatures.

DISCUSSION – The temperatures are usually in excess of 1706°F (930°C).



Figure 1: Detail from 1940s depicting clay units fitted around steel beam for fire protection



Photo 1: Clay units visible during firing process through an opening in a tunnel kiln

Material	Flame spread
Glass-fiber sound-absorbing blanks	15 to 30
Mineral fiber sound-absorbing panels	10 to 25
Shredded wood fiberboard (treated)	20 to 25
Sprayed cellulose fibers (treated)	20
Aluminum (with baked enamel finish on one side)	5 to 10
Asbestos-cement board	0
Brick or concrete block	0
Cork	175
Gypsum board (with paper surface on both sides)	10 to 25
Northern pine (treated)	20
Southern pine (untreated)	130 to 190
Plywood paneling (untreated)	75 to 275
Plywood paneling (treated)	100
Carpeting	10 to 600
Concrete	0

Figure 2: IBC Commentary Figure 803.1 Typical Flame Spread for Common Materials (Source: 2000 International Building Code Commentary. Copyright ©2001, International Code Council, Inc. All rights reserved.)

These temperatures are much greater than the 750°C used for the ASTM E136 test. Further, the extent of time a clay masonry unit is fired in a kiln is between 10 and 40 hours—much longer than the 10 minutes of exposure time required for the ASTM E84 test.

3. Brick masonry does not generate a flame or emissions (smoke). Because no fuel is present in brick masonry, no combustion can occur to generate a flame or smoke. Early versions of the *International Building Code* (IBC) Commentary in Chapter 8, Interior Finishes, Section 803 Wall and Ceiling Finishes, include a reference figure listing typical flame spread values for select building materials. Figure 803.1, “Typical Flame Spread for Common Materials” (Figure 2) indicates that the flame spread for a brick or concrete block material is 0.

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