



ENCLOSURE SOLUTIONS TECHNICAL BULLETIN — CMU-04

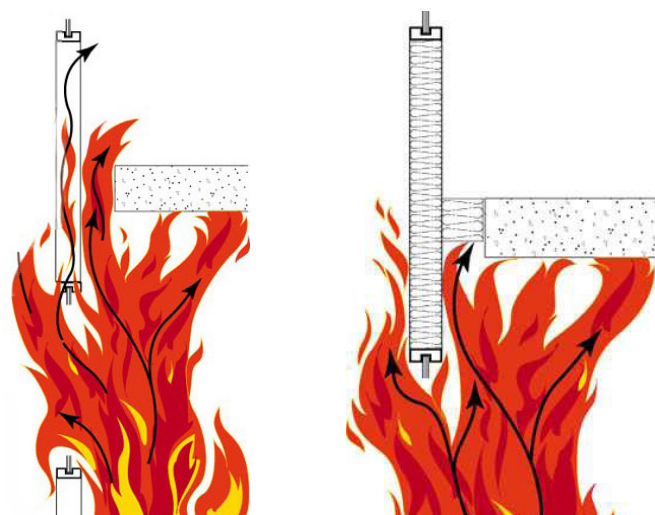
CMU WALL SYSTEMS, FIRE-RESISTANT JOINTS

ANSI/UL 2079 & ASTM E1966

CONTAINING FIRE SPREAD THROUGH JOINTS

Fire-resistant joint systems and perimeter fire containment joints are designed to prevent fire and hot gases from entering the room/stories above the room where a fire originates. Story-to-story spread occurs through voids or joints that exist in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roof or roof/ceiling assemblies. An unprotected void at the floor/wall intersection potentially creates a pathway for fire and/or smoke to spread from floor to floor in a building. Although such joints are often small, 2 to 3 inches wide, consider that, for a building with a floor plate size of 200 feet by 200 feet (800 lineal feet), an unprotected joint 3 inches wide creates 200 square feet of open area along the perimeter that will allow smoke and hot gases to flow freely from floor to floor. Fire can also pass through voids or combustible materials in the exterior wall itself. Given that the condition exists at each floor, the potential for fire and smoke spread is significant. Owens Corning® Enclosure Solutions for CMU Wall Systems provides details and fire-safing products if needed to design and construct fire-resistant joints as required in Section 715 of the International Building Code.

Figure 1



Unprotected Perimeter Joint

Protected with a Perimeter Fire Containment System

INTERNATIONAL BUILDING CODE (IBC)

The 2021 IBC, Section 715.4 requires approved perimeter fire-resistant joint systems where a gap exists in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roof or roof/ceiling assemblies. Although local codes may vary, fire-resistance-rated floor/ceiling assemblies are generally required in construction types I-A, I-B, II-A, III-A, and V-A. Fire-resistant joint systems may be inherent to common CMU construction techniques (see Figure 1), or, if voids are created, joint systems that are tested in accordance with ASTM E1966 or UL 2079 may be required (2021 IBC Section 715.3.1). Fire-resistant joint

systems must be tested, or determined via an engineering judgment, to provide an “F-rating” for a time period not less than the required fire resistance rating of the wall, floor or roof assemblies between which the joint is installed.

Often, the manner in which CMU wall systems intersect with floor systems creates an inherently fire-resistant perimeter containment condition (see Figure 1). However, when there are openings or pathways created in the construction as shown in Figures 2 and 3, Owens Corning® Enclosure Solutions Thermafiber® Perimeter Fire Containment mineral wool insulation products can be used to serve any typical building situation with an F-rating of two hours, equal to type I-A construction, the highest floor/ceiling assembly fire resistance rating specified in Table 601 of the IBC.

Even when the floor/ceiling assembly is not required to be fire resistance rated, Section 715.5.1 still requires that the joint be sealed with an approved material or system such as Owens Corning® Thermafiber® Safing and FireSpan® mineral wool insulation products to retard the interior spread of fire and hot gases between stories.

ANSI/UL 2079 & ASTM E1966

The ANSI/UL 2079 and ASTM E1966 test methods evaluate the ability of a fire-resistive joint system to undergo movement without reducing the fire rating of the adjacent fire-separating elements, and the duration for which test specimens will contain a fire and retain their integrity. Among the characteristics evaluated is the durability of the joint system through movement cycles, the ability of the joint system to prohibit the passage of flames and hot gases, and transmission of heat through the joint system. The test methods also include optional air leakage tests to determine the rate of air leakage through joint systems, resulting from a specified air pressure difference applied across the surface of the joint systems.

FIRE-RESISTANT JOINT DESIGN

Section 715.1 of the 2021 IBC requires “approved” fire-resistant joint systems. Although exterior wall system designs vary significantly, the Owens Corning® Enclosure Solutions for CMU is often inherently a fire-resistant joint system due to the typical construction details, as shown in Figure 1, which contains no voids or openings. If openings exist in the construction, they can be closed by using Owens Corning® Thermafiber® Safing products. Where gaps exist between the exterior wall and the floor slab, and if a fire-resistant joint is required, Owens Corning® Thermafiber® Safing can be used in a number of Underwriters Laboratories tested and listed fire-resistant joint systems, such as Figure 2 (CW-D-2005), Figure 3 (CW-D-2006), and Figure 4 (FW-D-1016).

UNDERWRITERS LABORATORIES JOINT DESIGN NUMBERING SYSTEM

The systems are identified by alpha-numeric designations. The first two characters, CW or FW, indicate the joint system is used for the interface between a floor and curtain wall, or a floor and wall, respectively. The third character, S or D, identifies if the joint system was tested for movement, "S" meaning static or not tested for movement, and "D" meaning dynamic or tested for movement. The number portion of the identification indicates the maximum distance that the joint can span between the wall and the edge of the floor. Numbers in the range of 000–999 are less than or equal to 2 inches. Numbers 1000–1999 are less than or equal to 6 inches. Numbers 2000–2999 are greater than 6 inches and less than or equal to 12 inches.

JOINT RATINGS F, I, T, AND L

The F-rating, or Integrity rating, expressed in hours, indicates the length of time that a fire-resistant joint can withstand fire before being consumed or before permitting the passage of flame through the opening.

The T-rating, or Insulation rating, expressed in hours, indicates the length of time that the temperature on the non-fire side of the penetration does not exceed 325°F (163°C) above the ambient temperature. This ensures that the temperature on the side of the wall away from the flame does not reach the flash point of any materials on that side of the wall.

The L-rating (optional), expressed in cubic feet per minute, is the amount of air (or cold smoke) that may leak through a penetration.

MOVEMENT RATINGS

ANSI/UL 2079 requires that joint systems with movement capabilities be cycled through the intended range of movement prior to fire testing. Movement cycling is intended to stress the joint design and test its durability while spanning between the elements of the fire-resistive assembly. Class I joints are subjected to 500 cycles at 1 cycle per minute; Class II, 500 cycles at 10 cycles per minute; and Class III, 100 cycles at 30 cycles per minute.

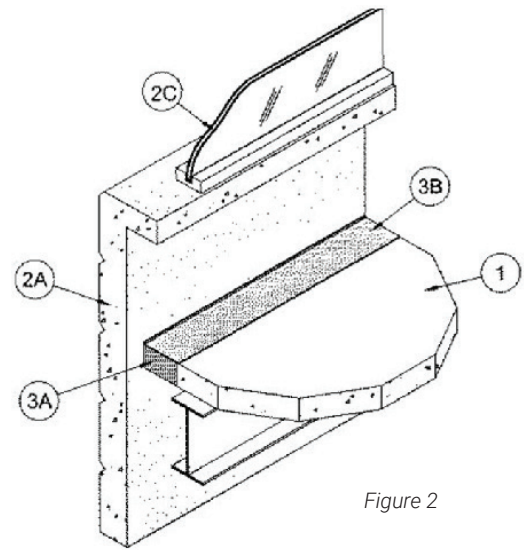


Figure 2

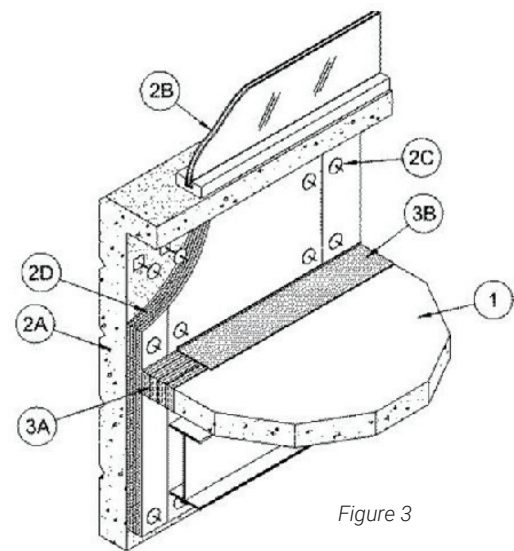


Figure 3

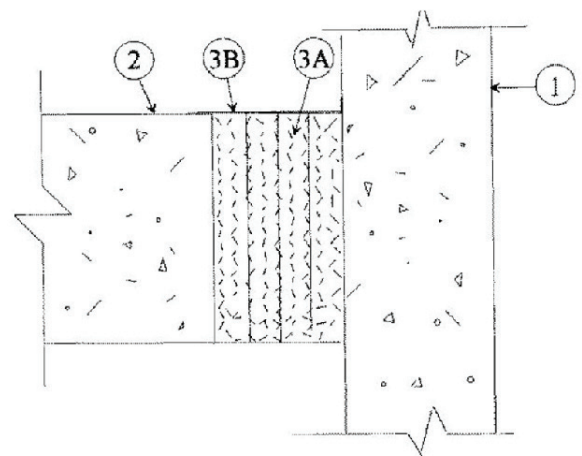


Figure 4

DESIGN NOTES:

- Often, the manner in which CMU wall systems intersect with floor systems creates an inherently fire-resistant perimeter containment condition (see Figure 1).
- Fire resistant joint systems (see Figures 2, 3, and 4) are specific constructions consisting of a floor, wall, or roof with an hourly fire endurance rating, and a joint material installed in the void between the floor/roof and the wall. The hourly rating applies only to the complete system. The individual components are not assigned a rating and are not to be interchanged between systems (i.e., manufacturer's components from one system being used to replace another manufacturer's components in a given system).
- Section 715.1 of the 2021 IBC requires an "approved" fire-resistant joint tested in accordance with ANSI/UL 2079 or ASTM E1966. Every building has unique design details that may not exactly match the system details published. The IBC recognizes that there may be variations per individual buildings that may require adjustment via engineering judgments and therefore enables "approval acceptable to the building official." Engineering judgments are typically based on testing, or data from similar fire-resistant joint system tests, other evidence and third-party engineering judgments that the proposed system meets the basic principles necessary for fire-resistant joint systems.
- Typically, safing insulation, if needed for the construction detail, is to be a minimum of 25% compression-fit between the slab edge and the wall system. Compression of the safing insulation creates a tight seal that maintains its integrity, preventing flame and hot gases from breaching through to the floor above.
- Apply smoke sealant to the top of the safing insulation to impede the passage of smoke if needed. The smoke sealant is commonly spray-applied to the top of the safing insulation (non-fire exposure side). Typically a 1-inch overspray is specified, extending the smoke seal onto the floor slab on one side, and the wall surface on the other, to create a continuous seal that impedes the passage of smoke.

References:

- International Building Code; International Code Council, Inc.; 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795.
- ANSI/UL 2079, Standard for Tests for Fire Resistance of Building Joint Systems, Underwriters Laboratories, 333 Pfingsten Road, Northbrook, IL 60062-2096.
- ASTM E1966, Standard Test Method for Fire-Resistive Joint Systems, ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.

Figure 5

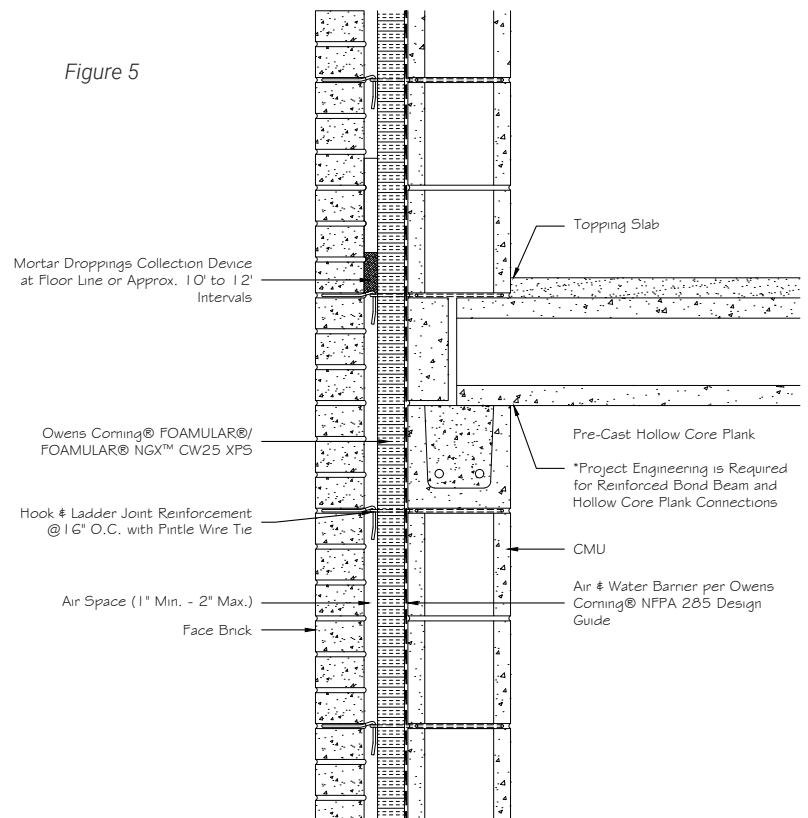
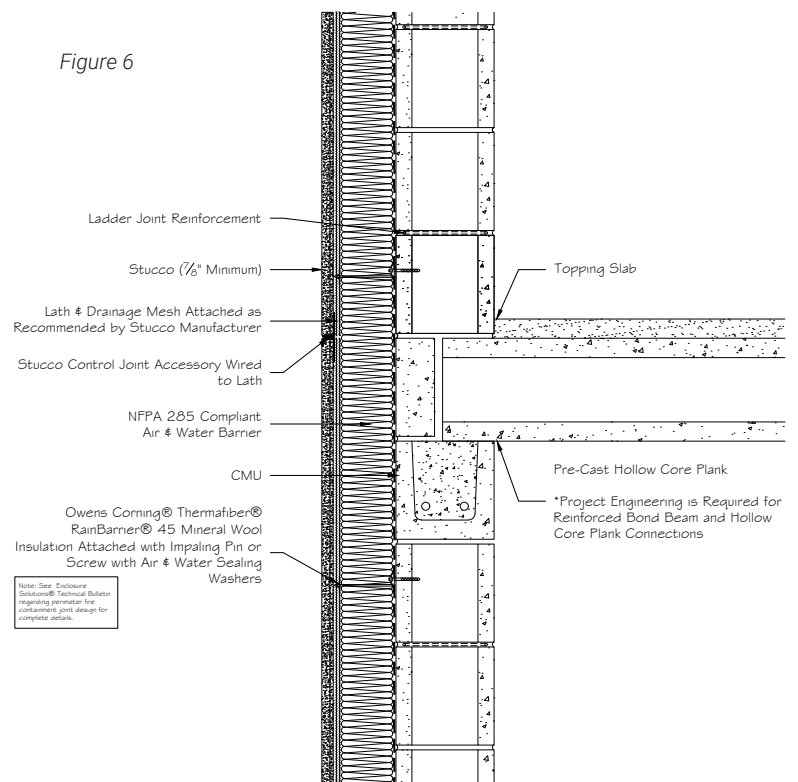


Figure 6



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