Basic Fire Wall Provisions for Post-Frame Construction

By Ronald L. Sutton, PE

The judicious use of fire walls is a powerful way for post-frame builders to comply with building code limitations regarding the *fire area*—"the aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls or horizontal assemblies of a building"—without adding an inordinate amount of cost to the project (International Building Code [IBC], 2015). All too often the option is not capitalized upon, and the project never comes to fruition, or a more costly means of code compliance is used. As post-frame contractors are asked to build ever larger projects, knowing and using the various options available is most valuable. Although the IBC is fair to all types of construction, the process of employing some provisions, like the use of fire walls, can be convoluted. For this reason, engaging a competent architect or engineer is a must. This article attempts to highlight and discuss the most general provisions contained in the 2015 IBC and outline how using fire walls can be beneficial.

In addition to fire walls, fire-rated assemblies are used for exterior walls (IBC Section 705), fire barriers (IBC Section 707), fire partitions (IBC Section 708), floor and roof assemblies (IBC Section 711) and shaft enclosures (IBC Section 713). Each use of a fire-rated assembly has unique and specific IBC provisions. It is important to know about the additional assemblies contained in the code, but attempting to address more than one of these in the same article would be very complicated.

Post-frame buildings are classified as Type V construction in the 2015 IBC. This is the type of buildings and structures constructed with wood and other combustible materials. Prior to the roll-out of the 2000 IBC, fire walls were required to be constructed using only noncombustible materials like steel, masonry, brick and concrete. The use of wood and other combustible materials in the fire wall assembly was not allowed. Beginning with the 2000 IBC, the use of fire walls with combustible materials was permitted in Type V construction.

In 2015 the National Frame Building Association successfully designed and tested a 3-hour load-bearing fire wall for post-frame construction (UL Design No. V304). This design uses wood columns, wood framing and four layers of 5/8"-thick fire-rated gypsum board applied to each side of the wall face. This design permits the columns to be embedded in the ground or surface-mounted on masonry or concrete. This UL approval also permits using three layers of 5/8"-thick gypsum installed on both faces to achieve a 2-hour rating and two layers of 5/8"-thick gypsum on both faces for a 1-hour rating.

Having an approved post-frame fire wall is a huge advantage for post-frame builders. It permits builders to construct this fire-rated element with their own crew personnel, using no special equipment and without reliance on specialty subcontractors. The post-frame contractor is in complete control, can build in every season, can ensure that deadlines are met and generally saves significant time.

IBC Section 706.1 emphasizes why a fire wall is so important: it states that "each portion of a building separated by one or more fire walls … shall be considered a separate building." Therefore, when a project's fire area exceeds the area threshold, requiring the installation of an automatic sprinkler system, the project can be constructed by installing one or more fire walls. This avoids the inordinate expense that can be added to a project, especially to post-frame projects in rural locations. The use of fire walls to eliminate the need for a sprinkler system helps make post frame a viable option when the building location does not have an adequate water supply for a sprinkler system.

A number of specific requirements in the 2015 IBC govern the design of fire walls, but it is important to identify and address five of the most important: vertical continuity, horizontal continuity, structural stability, required fire-resistance ratings, and openings.

Vertical continuity—Section 706.6 requires fire walls to extend from the foundation to a termination point 30 inches above both adjacent roofs. The 30-inch extension (parapet) that many find objectionable can be avoided and the wall terminated at the underside of noncombustible roof sheathing such as steel roofing (Section 706.6, exception 3).

Horizontal continuity—Section 706.5 requires fire walls to be continuous from exterior wall to exterior wall and to extend at least 18 inches beyond the exterior surface of the exterior walls. Exception 2 in that section permits fire walls to terminate at the interior surface of noncombustible exterior sheathing.

Structural stability—Section 706.2 discusses structural stability, an important provision in the design of a code-compliant

fire wall and a design provision that is often difficult to achieve. Section 706.2 requires fire walls to be designed and constructed to allow collapse of the building structure on either side without collapse of the wall. NFBA's post-frame fire wall, UL–V304, inherently makes this requirement easier to fulfill than would most walls of steel, masonry or concrete. Post-frame wall construction using columns embedded in the soil or in concrete piers adds great stability against collapse and makes this difficult task somewhat easier.

Required fire-resistance ratings—IBC Table 706.4 contains the required ratings for fire walls. Two-hour and 3-hour fire-resistance ratings are typically required for most common uses.

These use groups require a 2-hour rating:

- Assembly–Group A
- Business–Group B
- Educational–Group E
- Low-Hazard Factory–Group F-2
- Low-Hazard Storage–Group S-2
- Utility – Group U.

These use groups require a 3-hour rating:

- Moderate hazard factory–Group F-1
- Moderate hazard storage–Group S-1
- Mercantile–Group M.

IBC Sections 302–312 provide a more complete description and explanation of the various use groups.

Openings—Section 706.8 permits fire-rated openings 156 square feet and less and not more than 25 percent of the wall length. Opening protection for 3-hour and 2-hour walls is required to have a minimum rating of 3 hours and 1.5 hours, respectively.

Arguably, when an adequate supply of water is available from municipal water or a lake, pond or reservoir, installing an automatic sprinkler system is normally the best option to address fire area issues. The installation of sprinklers permits the area of a building to be four times the area allowed when there is no sprinkler system and increases the number of stories allowed by one story.

However, frequently the post-frame builder is asked to construct a building of a certain area, but the location lacks a water supply adequate to support an automatic fire-suppression system. In these instances the cost to install both an automatic sprinkler system and provide a water supply by a reservoir or another source usually makes the project unaffordable.

The good news, if there is any, is that the fire area threshold requiring suppression is driven by use, not construction type. That is to say that all construction types must have an automatic suppression system installed when this minimum area is exceeded. For example, when the fire area of a restaurant or a banquet hall (Use Group A-2) exceeds 5,000 square feet, the building must be suppressed. Also, when the fire area of a repair garage for commercial vehicles (Use Group S-1) or a commercial parking garage (Use Group S-2) exceeds 5,000 square feet, this use must be suppressed as well. These are all typical applications for post-frame construction. Even the more typical 12,000-square-foot limitation is often problematic.

As projects get bigger and building codes are enforced more "by the book," knowing your options becomes more important. Having multiple options is certainly a good thing, and installing a code-compliant fire wall is always an option.

The IBC provisions for fire walls found in Section 706 can be complicated; they contain numerous exceptions and other nuances. When installing a fire wall is the best option, the owner, contractor, design professional and building official working in concert will usually achieve an acceptable solution. FBN

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Reference

International Code Council. 2015. International Building Code. Country Club Hills, IL: ICC.