



Expert Tips

Exterior Walls in Buildings with Mass Timber Floors – Part 2: Common Floor-to-Wall Details

Reviews common detailing options for mass timber floor-to-exterior wall intersections

For information on allowable exterior wall materials in buildings with mass timber floors, see [Part 1](#) of this series.

In buildings with mass timber floors, detailing of the floor-to-exterior wall intersection deserves careful attention. It is important to ensure not only load path continuity, but that fire protection of the floor and both faces of the wall have been appropriately addressed. In many cases, the required fire-resistance rating (FRR) for the wall and floor don't match and the floor-to-wall intersections require additional consideration to achieve fire-resistance continuity.

Structural Stability and Fire Protection

Section 705.6 of the International Building Code (IBC), which discusses structural stability of exterior walls, is intended to ensure that, during a fire event, the exterior wall prevents the spread of fire while maintaining its structural integrity. The wall must be designed to carry loads under normal conditions. The exterior wall and supporting construction must also be designed to achieve the required FRR.

IBC 2021 705.6 (IBC 2024 705.7) Structural stability. Exterior walls shall extend to the height required by Section 705.11. Interior structural elements that brace the exterior wall but that are not located within the plane of the exterior wall shall have the minimum fire-resistance rating required in Table 601 for that structural element. Structural elements that brace the exterior wall but are located outside of the exterior wall or within the plane of the exterior wall shall have the minimum fire-resistance

IBC 2021 Section 705.6 contains specific requirements regarding fire protection for members that brace the exterior walls. Where interior structural elements such as floors and roofs provide this bracing, this section does not cause an increase in the FRR for the entire floor or roof assembly; the required FRR is determined using Table 601 for the bracing element and not the exterior wall. The 2021 IBC Commentary states that “[a]lthough the floor framing acts as a lateral support for the exterior wall, this section does not require that the entire floor system be of fire-resistance-rated construction [...] Only the structural element within the floor system that supports the vertical load of the wall must be of fire-resistance-rated construction.”

Where floors do not support the exterior wall (e.g., bypass framing), there are no additional FRR requirements for the floor other than those in Table 601. However, in instances where the floor supports an exterior wall, either partially or fully (e.g., platform framing), some of these elements may have additional FRR requirements. Portions of the floor or members that support the upper wall must be able to maintain an FRR that is the greater of the FRR requirement for the floor or exterior wall. For example, rim joists or blocking used for vertical wall load transfer are required to have an FRR that meets or exceeds the FRR requirement of the wall. Other members that are part of the floor framing, such as joists, panels, or sheathing, might also intersect the wall framing, but unless they’re wall-supporting members, the FRR of the wall does not apply. The 2021 Commentary discusses this, providing Figure 705.6 (Figure 1) to illustrate the condition where the exterior wall has a required FRR while the floor system does not, and stating that for “light-frame platform construction, this will require that the band joist or beam supporting the floor and the wall above to also be of fire-resistant construction.”

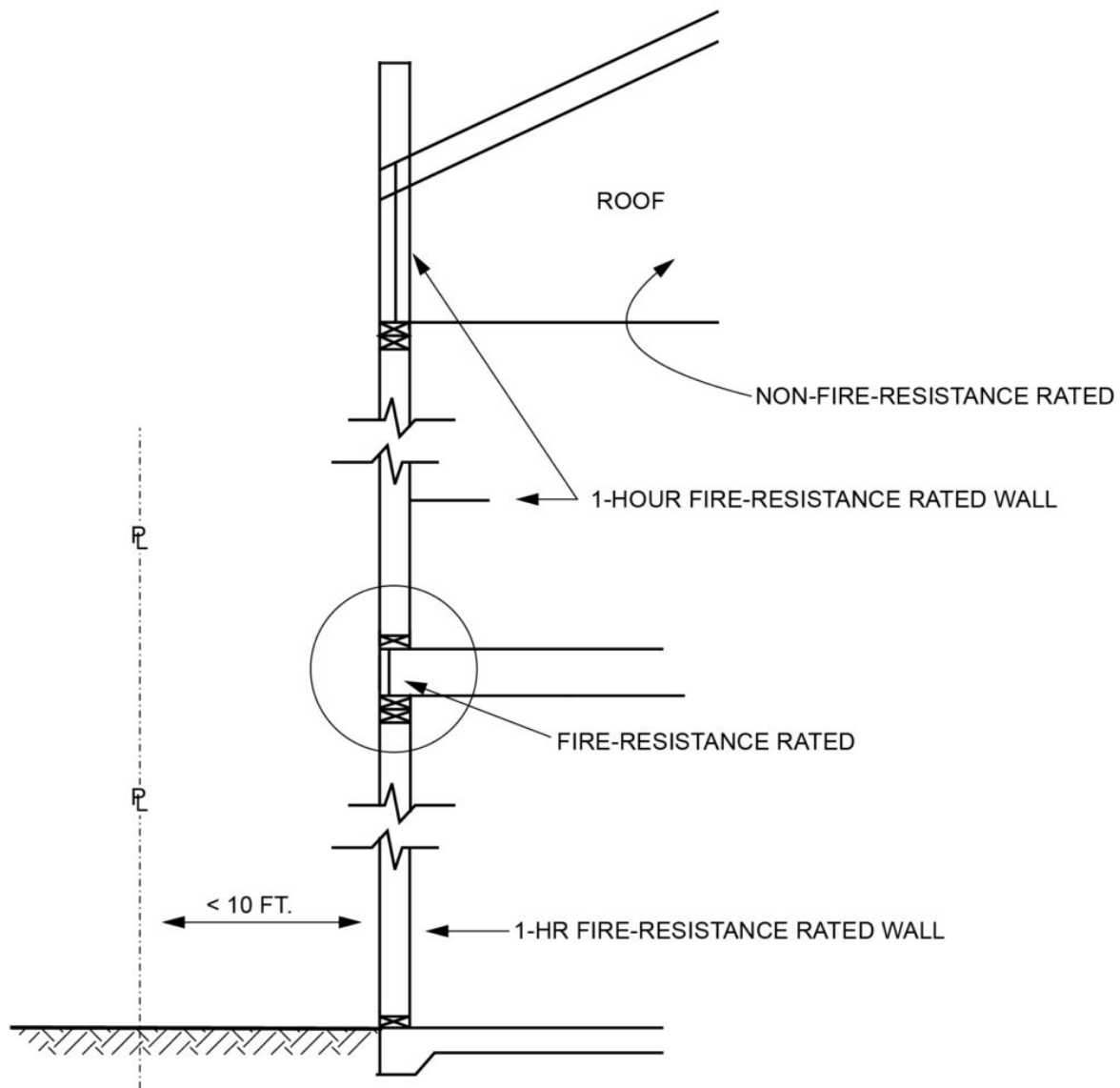


Figure 1: IBC 2021 Commentary Figure 705.6 International Code Council²

To further clarify the intent of the code, this portion of 2021 Commentary has been expanded and moved into the body of the 2024 IBC through the addition of Section 705.7.1, providing specific guidance for structural stability of exterior walls utilizing Type III construction. For light-frame construction, this condition has been further considered in the American Wood Council's (AWC's) *Design for Code Acceptance 3* (DCA-3).

New Section: IBC 2024 705.7.1 Floor Assemblies in Type III Construction. In Type III Construction where a floor assembly supports gravity loads from an exterior wall, the fire-resistance rating of the portion of the floor assembly that supports the exterior wall shall not be less than the fire-resistance rating required for the exterior wall in Table 601. The fire-resistance rating provided by the portion of the floor assembly supporting and within the plane of the exterior wall shall be permitted to include the contribution of the ceiling membrane when considering exposure to fire from the inside. Where a floor assembly supports gravity loads from an exterior wall, the building elements of the floor construction within the plane of the exterior wall, including but not limited to, rim joists, rim boards, and blocking, shall be in accordance

with the requirements for interior building elements of Type III construction.³

It is important to remember that the allowable materials (i.e., combustible or noncombustible in accordance with IBC Section 602) for floor construction are independent of the FRR requirements. This is emphasized in the last sentence of IBC 2024 Section 705.7.1, which states that "... the building elements of the floor construction within the plane of the exterior wall [...] shall be in accordance with the requirements for interior building elements ...". This provision is especially important in Type III construction, where, in accordance with Section 602.3, exterior walls must utilize noncombustible framing or fire retardant-treated wood (FRTW) while non-FRTW interior elements are acceptable.

While the 2024 IBC Section 705.7.1 and 2021 IBC Section 705.6 Commentary specifically identify elements common to light-frame wood construction (e.g., rim joists, rim boards and blocking), these provisions can also apply to mass timber construction. An example can be seen in Figure 2. In the case of mass timber floors, only a portion of the floor panel is required to support wall loads; when applying IBC 2024 Section 705.7.1, this wall-supporting portion of the floor panel must achieve the greater FRR of either the floor or exterior wall. The remainder of the mass timber floor is not required to support the wall above and therefore, the FRR for the floor is only required to meet the interior floor FRR requirements.

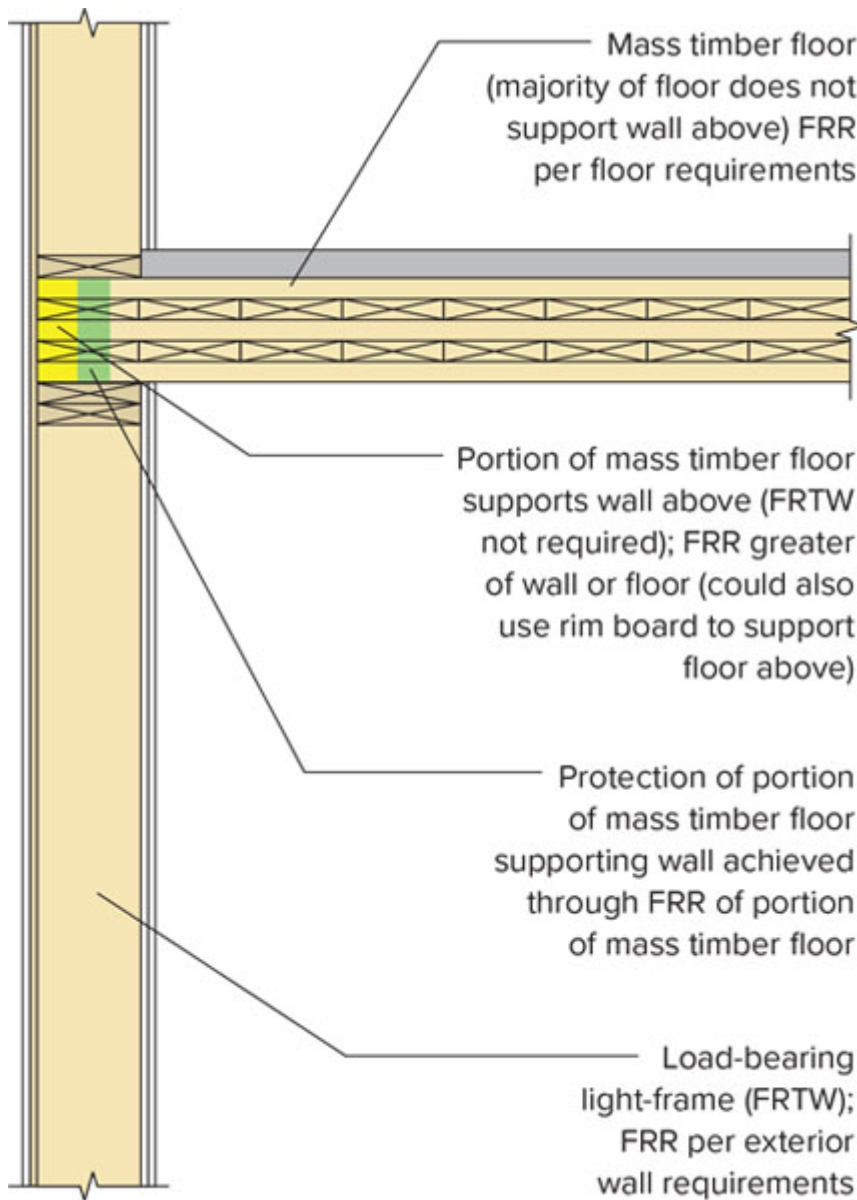


Figure 2: Type III construction – Application of IBC 2024 Section 705.7.1 for mass timber floor construction with protection from interior face of wall

In addition to providing the appropriate FRR and materials at the floor-to-wall intersection, it is important to ensure that the fire rating is continuous in order to restrict the spread of fire. Achieving continuous exterior wall FRR at the floor level, especially in platform-framed construction, requires careful attention to detailing. To alleviate any uncertainty regarding the requirements for exterior wall FRR continuity, the 2024 IBC includes a new section, 705.6. This section clarifies that the exterior wall's FRR requirement does not include the floor sheathing, deck, or slab, but rather should be continuous from the top of sheathing, deck, or slab below to the underside of sheathing, deck, or slab above. For projects utilizing mass timber floors, the “deck or slab” in 705.6, Item 1 would be the floor/ceiling assembly. The application of this new provision for light-frame wood and mass timber floor construction can be seen in Figures 3 and 4. When applied to mass timber floors, this new section negates the requirements of partial FRR protection of the floor and allows for mass timber floors without any additional fire protection beyond that required for the floors.

New Section: IBC 2024 705.6 Continuity. The fire-resistance rating of exterior walls shall extend from the top of the foundation or floor/ceiling assembly below to one of the following:

1. The underside of the floor or roof sheathing, deck, or slab above.
2. The underside of a floor/ceiling or roof/ceiling assembly having a fire-resistance rating equal to or greater than the exterior wall and the fire separation distance is greater than 10 feet.

Parapets shall be provided as required by Section 705.12.³

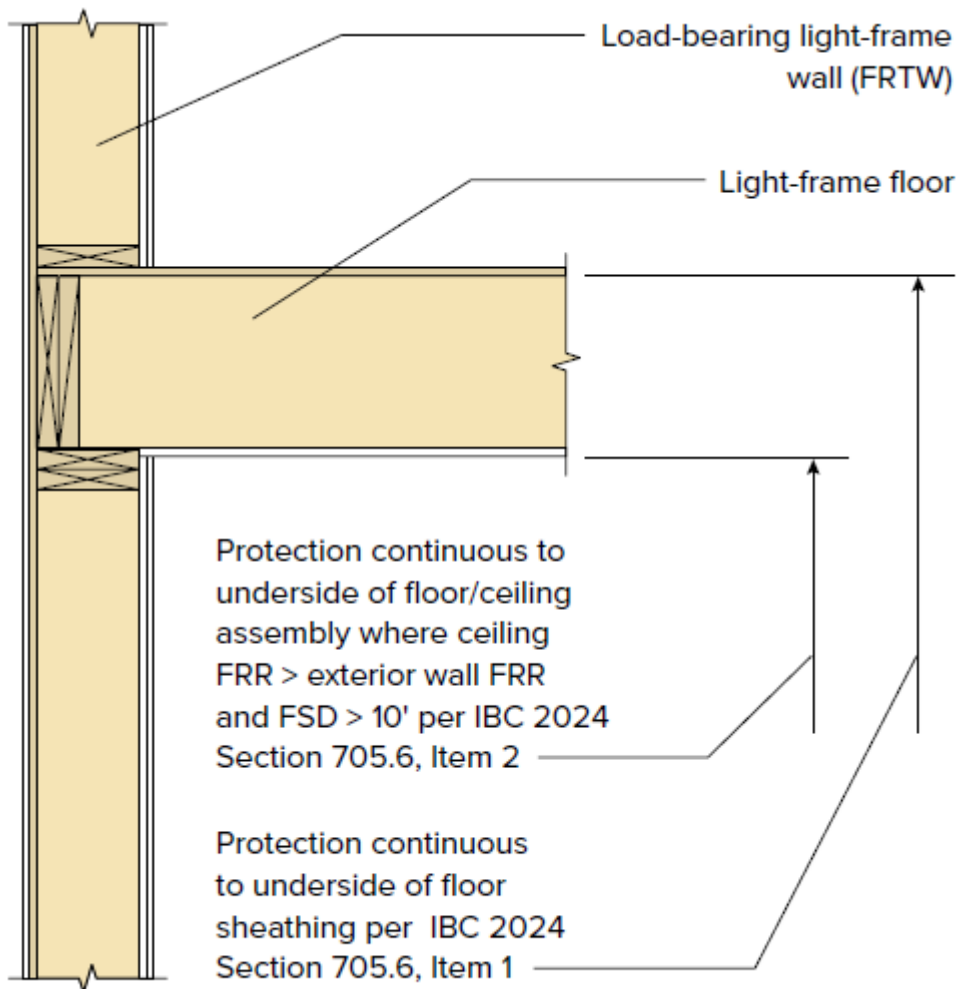


Figure 3: Type III construction – Application of IBC 2024 Section 705.6 for light-frame floor construction

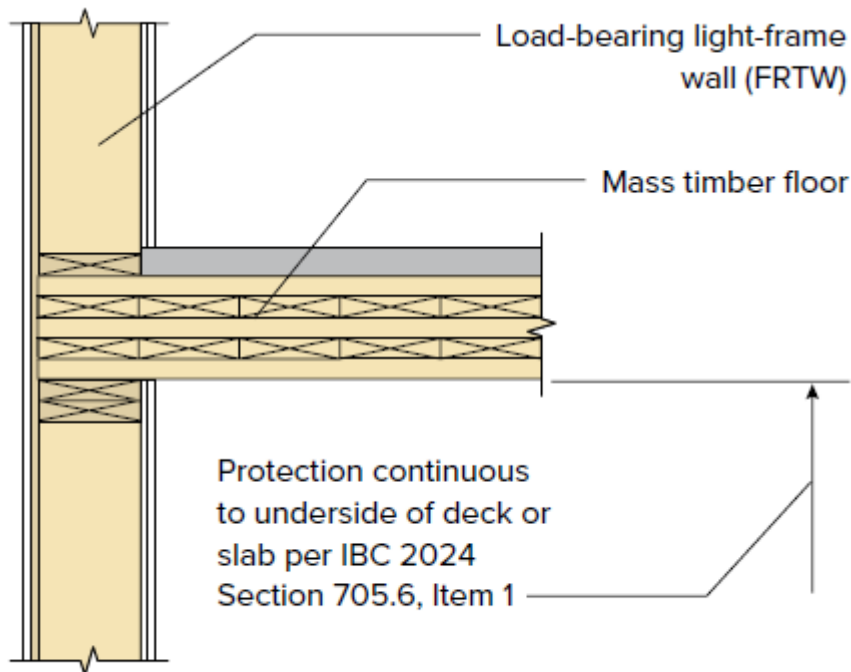


Figure 4: Type III construction - Application of IBC 2024 Section 705.6 for mass timber floor construction

Floor-to-Wall Detailing





To better understand the provisions above, it is helpful to consider various potential intersection scenarios and how the requirements can be met. As discussed in [Part 1](#) of this series, mass timber is permitted in several construction types, and each allows various exterior wall materials and requires different levels of fire protection for each face of the wall. For some of the most common material choices, potential options to meet the fire-resistance continuity at the floor-to-wall intersection are shown in Table 1. Note that these details apply to cases where the required FRR for the wall is greater than that of the floor; where the required FRR for the wall is the same as or less than that of the floor, the additional detailing principles shown here are not necessary as the fire protection and structural stability requirements will have already been satisfied.

Note that protection of the load transfer members can be achieved through several means, including additional wood elements used to protect the load-carrying elements and non-combustible protection (generally gypsum wall board). It is important to understand the construction type to know what is allowed for each scenario. Additional information on utilizing mass timber members in fire-resistance rated construction can be found in the WoodWorks paper, [*Fire Design of Mass Timber Members: Code Applications, Construction Types, and Fire Ratings*](#).

There are several additional protection requirements specific to Type IV construction, including the requirements for non-combustible fire protection in some locations and fire-rated floor topping requirements. For more information, the WoodWorks paper, [*Demonstrating Fire-Resistance Ratings for Mass Timber Elements in Tall Wood Structures*](#), discusses these provisions.

Table 1: Options for meeting fire-resistance continuity by exterior wall type

Legend:

-  Floor fire-rated surface
-  Wall interior face fire-rated surface
-  Wall exterior face fire-rated surface
-  Transfers load from wall above to wall below

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