



Expert Tips

CLT on Cold-Formed Steel Stud Bearing Walls: Engineering Tips for Hybrid Construction

Considerations for mass timber floor and roof panels on cold-formed steel (CFS) stud bearing walls.

Hybrid construction, combining mass timber with other structural materials, is increasingly popular as designers look to integrate more sustainable and efficient solutions into their projects. One approach gaining traction, especially in multi-family and hospitality projects, is using mass timber floor and roof panels on cold-formed steel (CFS) stud bearing walls.

Multi-family and hospitality projects often have interior wall layouts that are agreeable with mass timber floor panels. For these projects, it can be structurally advantageous to use the interior walls for bearing walls, especially when the walls stack floor-to-floor. In Type IV-C and IV-B buildings, which have non-combustible wall requirements, pairing mass timber floors with CFS stud bearing walls can be a good solution, especially for projects in the six to 10-story range.

For design teams familiar with CFS framing systems, mass timber floors are an easy switch from CFS/steel flooring. They allow owners/developers to incorporate a sustainable product, and often result in a thinner structural floor assembly (where the mass timber is thinner than CFS joists) and schedule savings. In most cases, a mass timber floor alternative will have minimal to no impact on an existing bearing wall layout.

From a code compliance standpoint, the options for construction type under the 2021 IBC which allow this hybrid system are:

- V-B
- V-A
- III-B
- III-A

- IV-C
- IV-B
- IV-A

For additional information on the process of selecting the optimal construction type for a mass timber building, considering building size, occupancy, and client goals, see the two following WoodWorks resources:

Key Design Consideration for Mass Timber Projects

Fire Design of Mass Timber Members: Code Applications, Construction Types and Fire Ratings

There are some unique engineering considerations when using the CFS + mass timber hybrid approach. Here are a few:

Typically, a CFS bearing wall's top and bottom tracks are relatively thin and distribute load from the CFS studs less uniformly. At the CFS studs to cross-laminated timber (CLT) interface, isolated perpendicular-to-grain stresses on the top and bottom of the CLT panels can be significant. It is typical to use an additional structural distribution member added between the base of the upper wall and the top of the CLT, as well as between the head of the lower wall and underside of the CLT, to distribute forces more evenly to the CLT panels. Solutions include using a structural steel tube or a nested track header, determined by the magnitude of the wall/studs loads.

Some projects have used very thick, heavy gauge top and bottom tracks. However, these often have a problematic radius, creating a situation where the studs do not bear fully on the web of the track. When using a heavy gauge track solution, ensure that adequate stud to track bearing can occur.

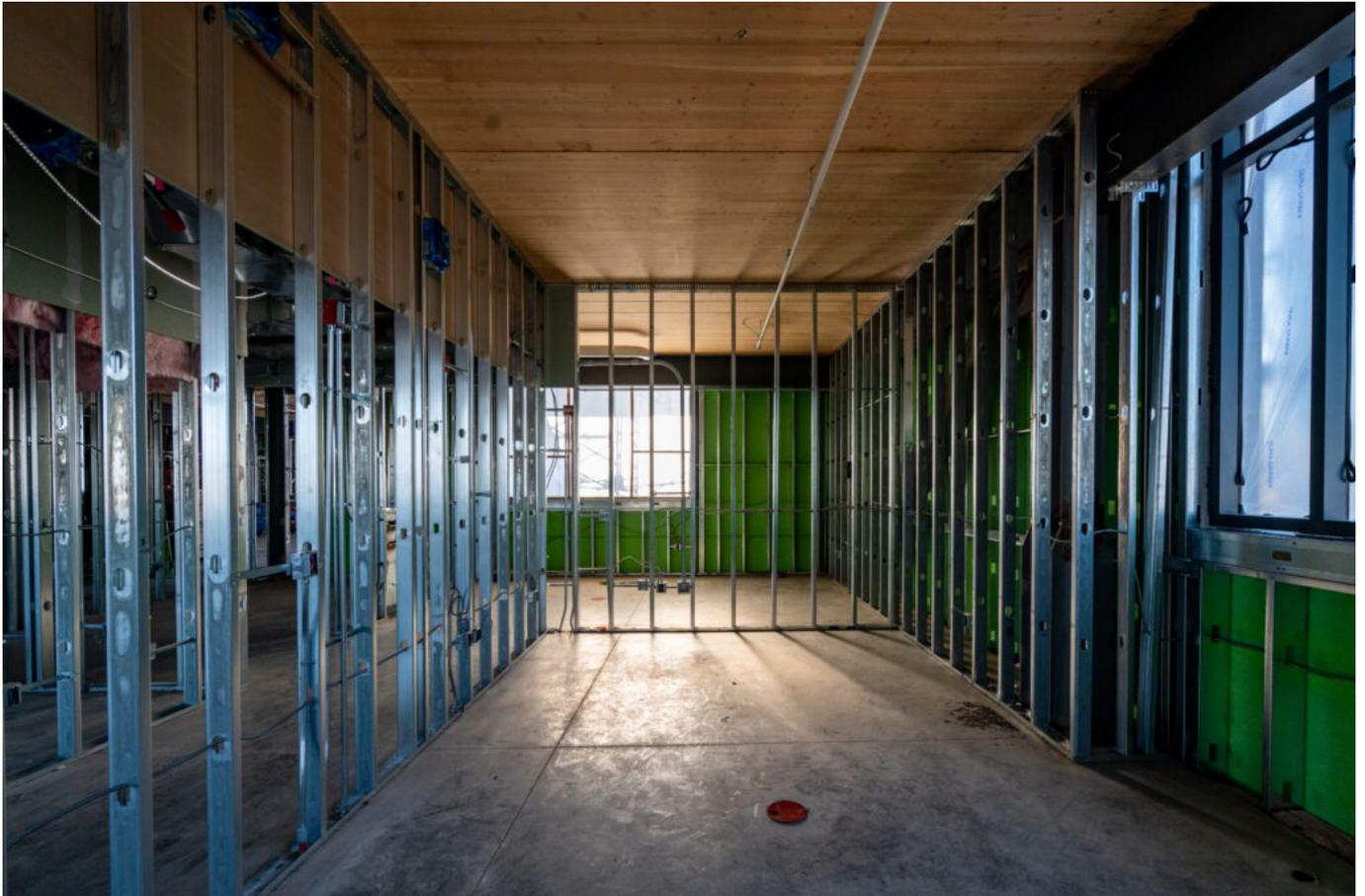
Multi-story framing systems where the walls or columns bear on horizontal timber elements are commonly called "platform-framed". In such configurations, potential shrinkage through the thickness of the CLT panels should be included in the vertical movement and differential settlement analysis. Since walls bear directly on mass timber panels that bear directly on walls below, any shrinkage that occurs in each mass timber panel accumulates over the height of the building. For example, in an 8-story building with 5-ply (6.875") CLT floor panels, with an equilibrium moisture content 8% lower than the moisture content at installation, the total building shrinkage would be about 1.1". WoodWorks' paper [Differential Material Movement in Tall Mass Timber Structures](#) includes methods to estimate the shrinkage. The procedure is similar when mass timber hybrid systems utilize wood stud bearing walls.

Lastly, panelizing the CFS walls off-site—to speed up their erection and keep up with the install speed of the mass timber panels—is common and should be considered. Coordination between two (or more) materials suppliers, and potentially

multiple installation crews, should be given adequate time, so be sure to plan accordingly.



Bunker Hill Housing Redevelopment – Building M / Stantec
McNamara • Salvia / photo McNamara • Salvia



Beaverton Public Safety Center, Beaverton, OR
FFA Architecture and Interiors / Photo: Marcus Kauffman

Examples of projects which have used this hybrid approach:

- [Bunker Hill Housing Building M](#) | Boston, MA
- [Cascada](#) | Portland, OR
- [Minnesota Places](#) | Portland, OR