

October 20, 2025

SUMMARY: There is a significant difference between membrane protection and individual column encasement when designing for fire protection of a structural post incorporated into a cold-formed steel fire resistive wall. In the first case, fire protection of the tube is provided by the presence of wall panels (typically Type X gypsum board) that is used to furnish fire resistance properties for walls. The second case is individual column encasement where the tube is wrapped with fire resistive material independent of the wall cladding. The building code has specific provisions for the use of membrane protection. This issue comes up from time to time between designers and AHJ's and this technical bulletin was created to provide some clarity.

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Scope

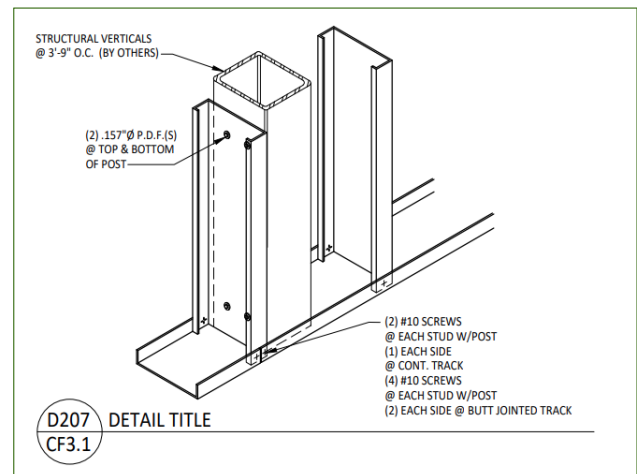
This paper will discuss the use of specific types of structural posts and headers/beams that do not require a primary frame level of Fire Protection when embedded in the cavity of a fire-resistance rated cold-formed steel (CFS) framed wall.

When is Membrane Protection Adequate Fire Protection of Structural Posts?

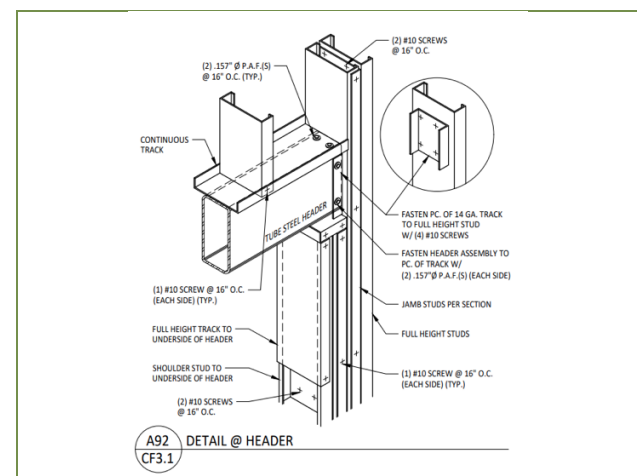
While it is not unusual to design hollow steel shapes into CFS walls at locations such as heavy header supports, isolated small transfer beams and shear wall end posts, some *Authorities Having Jurisdiction, AHJs* have requested column fire rating surrounds in some of these instances. This is contrary to the code, which has for some years allowed the membrane protection of the CFS-framed wall to provide adequate Fire Protection for these posts. They are usually defined as single story elements, or members captured between top and bottom tracks of the wall framing.

This paper is intended to clarify the issue and is for general public consumption as well as for the information of AHJs.

At right, details D207 and A92 are taken from raSmith structural drawings. They reveal a structural tube embedded in a cold-formed steel framed wall.



Detail D207. Source: raSmith



Detail A92. Source: raSmith

Overall Statement of Impact – Regulations and Requirements

The following are the potential consequences of requiring individual column enclosures:

- Wall thickness would have to be increased to accommodate the added thickness of the individual column enclosures. This will reduce the usable floor area.
- The sequencing and scheduling of the project will shift to accommodate the installation of the column enclosures.
- This requirement will have a negative impact on constructability. The ability to install the required fire protection materials on the post with limited accessibility may be a challenge.
- Increase the cost of the project.

Code Background – IBC Section 704.3.1¹

Language specific to the fire-resistance ratings requirements for structural members is found in Section 704. The section differentiates between fire protection for the members of the *primary structural frame*, the *secondary structural members* and what the code terms *light-frame construction*.

With notable exceptions, individual column encasement protection is required. That is interpreted as a column that is wrapped on all sides with the appropriate fire-resistant material. The notable exception are those columns that meet the limitations of Section 704.3.1 (704.4.1 prior to 2024). Section 704.3.1 is titled *Light-frame construction*. The use of *membrane protection* is referenced in both secondary structural members and *light-frame construction*.

The concept of the *membrane protection* for an embedded structural post has been codified for many years within IBC. Starting back in the 2009 IBC, recognizing the features of *light-frame construction* used the concept of

membrane protection. The language of 704.3.1 (see footnote) further evolved until the 2018 edition was released and has remained unchanged through the 2024 version. This edition reads as follows:

From the 2024 International Building Code:

Studs, columns and boundary elements that are *integral* elements in *walls of light-frame construction* and are located entirely between the top and bottom plates or tracks shall be permitted to have required *fire-resistance ratings* provided by the *membrane protection* provided for the *wall*.

The above section is titled *Light-frame construction* which the IBC defines as:

Construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or cold-formed steel framing members.

Where the terms stud and column are fairly self-evident, the concept of boundary elements requires discussion. Boundary elements are those structural elements that are cited in the abstract. They include special framing requirements at the end of shear walls, vertical structural elements to support specific headers, or transfer beams and concentrated loads. Boundary elements are further recognized as those structural members that are intended to resist seismic loading.

The term *integral* in this context can be interpreted to mean that the structural post is essential to the structural performance of *light-frame construction*. Should the post be a critical element similar to a stud in the structural performance of *light-frame construction*, then *membrane protection* of the post is acceptable.

This concept is not new. Structural beams that are entirely enclosed within the plenum of a fire-resistant floor-ceiling assembly do not require individual encapsulation. This has been allowed for many decades.

The term *membrane protection* is not defined in the code, but in this case is interpreted in a CFS framed partition

¹ 2024 IBC Section 704.3.1 was originally named 704.4.1 in prior IBC versions.

as a continuous material mechanically attached to each flange of the stud. The continuous material such as a gypsum panel works in tandem with the framing to provide the wall assembly fire resistant rating.

General Statements and Considerations

The code has been consistent over the years as to requiring the individual fire-resistant enclosure for columns when used as a primary structure. Recognizing the unique characteristics of framed construction, Section 704.3.1 emerged in the 2009 IBC. The 2024 version waives the individual encapsulation requirement when the column is embedded in fire-resistant rated wall assembly.

In *light-frame construction* the *membrane protection* of the wall assembly is deemed as providing the required fire protection of studs, column, and boundary elements. A requirement for this *membrane protection* is that the post be terminated at the top and bottom track, or the post is totally encased within the wall system.

This last provision was added in 2018 for general clarity, however, it has ordinarily been acceptable to allow for members and connection elements to project

beyond the tracks (and be encased in the deck or concrete for instance), for constructability. This is so long as the membrane protection can be shown to be essentially continuous.

Conclusion

It is concluded CFS framed walls fall under the definition of light frame construction.

Therefore, under Section 704.3.1 structural posts when used as studs, columns or boundary elements can be adequately protected from fire by the *membrane protection* of the CFS framed wall. The stipulation is that the post is integral to, and entirely encased within, the CFS framed wall assembly. This is depicted in the illustrations, Detail D207 and Detail A92 at the beginning of this document. The only stipulation as to stud depth and thickness is that the proposed framing cannot be less in size or steel thickness to what was originally tested. Stud spacing cannot be greater than what was originally tested.

It is assumed that membrane protection will be provided by the addition of gypsum wallboard attached to both flanges of the cold-formed steel C-shape stud.