**ISSUE:**

The 2016 California Building Code (CBC) Section 202 defines the Primary Structural Frame as the: Columns; Structural Members, Floor Construction and Roof Construction (all having direct connections to the columns); and Bracing members essential to the vertical stability of the primary structural frame under gravity loading.

CBC Section 704.2 requires all columns that are required to be protected, to be protected with individual encasement protection throughout the entire column height. This section clarifies that columns extending up through ceiling must extend the required encasement protection from the foundation to the beam above.

By definition, a light-frame construction wall is primarily built with repetitive studs. When braced by sheathing or gypsum board attached to the wall framing, the design of studs, multiple studs, or posts is similar based on the l/d for the member buckling out of the plane of the wall. Perpendicular to grain bearing of the studs on the top and bottom plates is also a consideration and is the same regardless of whether the studs are spaced, studpacks, or posts. The structural design of all of these members is considered column design.

An issue occurs when studs, multiple studs or solid sawn members framed integrally within a fire resistance rated light frame wall are treated as columns according to the definition of primary structural frame and are required to be provided with individual encasement protection. These larger groupings of studs or solid members within a light frame wall never have less fire resistance than the fire resistance rated wall based on tests of walls with individual spaced studs.

Section 704.4.1 of the 2016 CBC allows studs and boundary elements that are integral elements in load bearing walls of light frame construction to have the required fire resistance rating provided by the membrane protection provided for the load bearing wall.

A key question --- what does “that are integral elements in load bearing walls of light frame construction” mean in the context of this section?
PROPOSED POLICY:
Studs, boundary elements, posts, multiple stud groups, built-up columns and solid columns that are framed within the wall and do not penetrate the top or bottom plates are all designed to the same criteria and shall be considered integral elements. These elements that are integral within the confines of the load bearing wall, and do not penetrate the top or bottom plates, shall be permitted to be protected in light frame construction by the membrane protection of the fire resistance rated bearing wall.

CODE REFERENCE(S): 2016 CBC

Section 202, Definition

Primary Structural Frame. The primary structural frame shall include all of the following structural members:
1. The columns;
2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels;
3. Members of the floor construction and roof construction having direct connections to the columns; and
4. Bracing members that are essential to the vertical stability of the primary structural frame under gravity loading shall be considered part of the primary structural frame whether or not the bracing member carries gravity loads.

Section 704.2 Column Protection. Where columns are required to have protection to achieve a fire-resistance rating, the entire column shall be provided individual encasement protection by protecting it on all sides for the full column height, including connections to other structural members, with materials having the required fire-resistance rating. Where the column extends through a ceiling, the encasement protection shall be continuous from the top of the foundation or floor/ceiling assembly below through the ceiling space to the top of the column.

Section 704.3 Protection of primary structural frame other than columns. Members of the primary structural frame other than columns that are required to have protection to achieve a fire-resistance rating and support more than two floors or one floor and roof, or support a load-bearing wall or a nonload-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required fire-resistance rating.

Exception: Individual encasement protection on all sides shall be permitted on all exposed sides provided the extent of protection is in accordance with the required fire-resistance rating, as determined in Section 703.

Section 704.4 Protection of secondary members. Secondary members that are required to achieve a fire-resistance rating shall be protected by individual encasement protection.

704.4.1 Light-frame construction. Studs and boundary elements that are integral elements in load-bearing walls of light-frame construction shall be permitted to have required fire-resistance ratings provided by the membrane protection provided for the load-bearing wall.