

Fire Engineering®

Construction Concerns: Hybrid Buildings

Article and photos by Gregory Havel

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A hybrid building is one that combines structural elements from more than one of the traditional five types listed in the building codes. Hybrid buildings are classified by building officials as the type which uses the most combustible elements.

The most common hybrid is the lightweight wood frame (Type V) supported by structural steel (photo 1). This type of hybrid can be a single story or multiple stories. Traditional wood frame construction was usually limited to three stories because of the limited length of studs for balloon framing and the inherent instability of platform construction over three stories.



(1)

Since most of these buildings are multifamily residential, they are protected by residential automatic fire sprinkler systems installed according to National Fire Protection Association (NFPA) 13R. These systems protect only occupied space within the building, but not concealed (void) spaces.

Typically, the steel girders that are used have boards bolted or pinned to their top flanges to provide for nailing the wood trusses or I-joists (photo 2). When the building is complete, these details will be completely concealed by gypsum drywall board or other room finishes (photo 3) except in unfinished areas like utility rooms and basements.



(2)

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(3)

If a fire is confined to a single room, the steel will be protected by the gypsum drywall board, and by the automatic fire sprinklers.

When the fire breaks through the drywall board into the interconnected concealed spaces (photo 4), the steel will be exposed directly to the fire without the protection of the sprinklers. This exposure can reduce the strength of the steel by heating, and cause local or progressive collapse of part of the building.



(4)

This type of construction requires a note on our preincident plan for the structure. In a fire, it may be no more stable than a similar building of lightweight construction without the structural steel.

Testing by Underwriters Laboratories and the National Institute of Standards and Technology in laboratories and acquired structures shows that lightweight construction is likely to collapse within five to seven minutes of ignition. The most appropriate fire attack may be a knockdown from the exterior, evaluation of the structure's stability, and search and overhaul in the interior if the remaining structure is stable enough to support it. In a multifamily building, this may mean using the reach of hose streams to knock down the fire from outside the apartment and evaluating structural stability before conducting search and overhaul operations.



Gregory Havel is a member of the Town of Burlington (WI) Fire Department; retired deputy chief and training officer; and a 30-year veteran of the fire service. He is a Wisconsin-certified fire instructor II, fire officer II, and fire inspector; an adjunct instructor in fire service programs at Gateway Technical College; and safety director for Scherrer Construction Co., Inc. Havel has a bachelor's degree from St. Norbert College; has more than 30 years of experience in facilities management and building construction; and has presented classes at FDIC.

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