

## U.S. Fire Administration / National Fire Academy

*Coffee Break Training***Topic: Fire-Resistance Ratings for Structural Building Elements**

**Learning objective:** The student shall be able to list test standards for fire-resistance ratings and identify components of specific rated designs for structural building elements.

When describing protective elements for buildings, “fire resistance” is characterized as the ability to confine a fire, to continue to perform a given structural function, or both.

The model building codes and NFPA 101, *Life Safety Code*<sup>®</sup> require that certain building elements meet minimum fire-resistance ratings, such as a 2-hour fire-rated wall or a 1-hour ceiling. In general, fire-resistive assemblies protect structural elements and separate occupancies, and serve as passive fire barriers providing compartmentation, enclosure, subdivision, or protection. Codes require them based on use and occupancy classification, building heights and areas, construction types, egress requirements, and other life safety and fire protection mandates.

Fire-resistance ratings are determined by testing a mock-up structural assembly according to procedures in the American Society for Testing and Materials (ASTM) E119 *Standard Test Methods for Fire Tests of Building Construction and Materials*, available at [www.astm.org](http://www.astm.org). The test also is known as NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Material*. This physical test establishes relative fire endurance under controlled but varying conditions of temperature and load.

Does an assembly with a 2-hour rating mean it will survive 2 hours in a hostile, uncontrolled fire? No, but it should last longer than one with a 90-minute, 1-hour, or 1/2-hour rating. Higher fire-resistant ratings should be considered as relative improvements over lesser ones.



The detail using intumescent caulking requires the caulking to be tooled into the gypsum within certain annual space limitations. Five pounds of heat-reactive expanding caulk without something to expand against does not maintain fire-rated sealant system. Unfortunately, the detail is typical of most applications.

The illustration shows a typical tested and rated assembly, its components, and its Underwriters Laboratories (UL) design number.

You can find detailed examples of fire-resistance rated assembly designs and their required components by browsing the Gypsum Association *Fire Resistance Design Manual* ([www.gypsum.org](http://www.gypsum.org)), Wood

Truss Council of America (WTCA) *Fire Resistance Rated Wood Truss Assemblies* ([www.sbcindustry.com](http://www.sbcindustry.com)) the UL *Fire Resistance Design Guide* ([www.ul.com](http://www.ul.com)) and Cold Formed Steel Council (CFSC) *Fire Rated Cold-Formed Steel Truss Assemblies* ([www.cfsc.sbcindustry.com/fa](http://www.cfsc.sbcindustry.com/fa)).

For additional information, refer to NFPA 5000, *Building Construction and Safety Code*<sup>®</sup>, Chapter 8; *International Building Code*<sup>®</sup>, Chapter 7; or NFPA 101, *Life Safety Code*<sup>®</sup>, Chapter 8.

Information and illustration courtesy of WTCA – Representing the Structural Building Components Industry.