

Determination of Thickness of SFRM for Beams/Joists in Restrained Assemblies

According to the International Building Code (IBC), 2009 and newer editions, "Fire resistance rated assemblies tested in accordance with ASTM E119/UL 263 shall be considered unrestrained unless evidence satisfactory to the authority having jurisdiction is furnished by a registered design professional showing that the construction qualifies for a restrained classification."

When the design professional has determined that the structure to be fireproofed is in a restrained condition, knowledge of the Building Code and the UL Fire Resistance Directory are vital in selecting the proper SFRM thickness. This information is provided to guide in the appropriate use of the UL Designs and SFRM thickness determination.

Section 712.4 of the 2009 International Building Code (IBC) states the following:

"The fire-resistance rating of structural members and assemblies shall comply with the requirements for the type of construction and shall not be less than the rating required for the fire resistance-rated assemblies supported."

In an example of a building classified as Type IB Construction, Table 601 of the IBC requires floor construction, primary structural frame and secondary members to all be rated for 2-hours. Table 601 also requires roof construction to be rated for 1-hour including supporting beams and joists.

In the case of a restrained 2-hour rated floor assembly, this clearly states that the fire resistance rating of the beams and joists in this assembly must also meet the 2-hour fire resistance rating requirement.

Section IV Beams: paragraph (3) in the front of the UL Fire Resistance Directory, states:

*"ANSI/UL 263 provides for beams to be included in two types of test assemblies. One type of test assembly contains a full representation of the floor or roof construction being supported by the beam. Classifications resulting from this type of testing may include: (1) Restrained Assembly Ratings, (2) Unrestrained Assembly Ratings, and (3) Unrestrained Beam Ratings. **Restrained Beam Ratings are not determined from this type of test assembly. Results from these tests are identified as Design Series Nos. A00, D00, G00, J00, or P00. The other type of test assembly contains a partial representation of the floor or roof construction. Classifications resulting from this type of tested assembly may include: (1) Restrained Beam Ratings and***

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(2) **Unrestrained Beam Ratings.** Ratings for floor or roof assemblies are not determined from this type of test assembly. Results from these tests are identified as Design Series Nos. N000 or S000.” The (N) or (S) Series designs are referred to as “beam-only” designs.

UL clearly states that (D) Series designs do not give restrained beam ratings and that restrained beam ratings and their required fireproofing thickness are only addressed in the UL (N) or (S) Series designs.

The only way to achieve the restrained beam rating required by IBC Table 601 is to transfer a restrained beam or joist with the appropriate restrained beam rating from an N-Series design into a D-Series for floors and the appropriate S-Series design beam or joist into the P-Series for roofs.

Example:

A floor assembly consists of 3-1/2 in. lightweight concrete on all fluted steel floor deck supported by W8x28 beams. The applicable building code requires a 2-hour Restrained Assembly Rating and that the beams supporting the assembly have the same hourly rating as the assembly.

For a 2-hour Restrained Assembly Rating, many UL D900 Series floor designs list a corresponding minimum beam thickness for a 1-hour Unrestrained Beam, which for this example does not satisfy the 2-hour rating required for the beam. To satisfy the 2-hour beam rating required by the code, one could substitute a 2-hour Restrained Beam from an N00 series design that lists the same product or one could use a 2-hour Unrestrained Beam thickness if listed in that D900 series design. In most cases, the former is preferable since the N00 series designs often offer a lesser thickness of SFRM, as indicated in the following table:

UL D900 Series Floor Design		UL N700 Series Beam Only Design	
		2 hr Unrestrained Beam Thickness	2 hr Restrained Beam Thickness
Product A	D902	11/16”	N759 9/16”
Product B	D925	1”	N782 11/16”
Product C	D949	13/16”	N791 9/16”

These rules are independent of design listing and apply to all fire resistive materials.