

**NFCA on Fire Resistance Fire Tests – Load Applied or no Load Applied
Large Scale, Small Scale Furnace & Affects on Fireproofing Thicknesses**



What’s the big deal if a fire-test is conducted with a load applied or without a load applied? **IT’S BIG!**

Both the International Building Code and the National Building Code of Canada’s Code state the same. The acceptance criteria for fire fire-resistance is determined in accordance with fire-test standards ASTM E119 *Standard Test Methods for Fire Tests of Building Construction*, UL 263 *Standard for Safety of Fire Tests of Building Construction* and, in Canada’s case, CAN/ULC-S101, *Standard Method of Fire Endurance Tests of Building Construction and Materials*.

Under fire test conditions, as time lapses, the furnace temperature increases, heating the structural building elements (beam, joist and/or assembly). As the element or assembly gets hotter, it’s ability to support a load of any kind is reduced, causing sagging of the assembly. As the assembly sags, stress is applied to the fireproofing material adhered to the underside of the beam, joist, floor/ceiling or roof/ceiling assembly which may cause it to delaminate. Even boards that are pinned to the assembly may be affected.



Beam Only Assembly Load



Floor Assembly Load



Horizontal assembly without load applied.



Horizontal assembly with load applied after fire testing. UL Images

The Problem, & Why

Is a “no load applied assembly a problem” when there will be a load applied in the building? YES, it’s a problem!! It’s a code violation, and a fire and life safety risk!

Why? The International Building Code – all versions - adopt ASTM E119 *Standard Test Methods for Fire Tests of Building Construction*, UL 263 *Standard for Safety of Fire Tests of Building Construction and CAN/ULC-S101, Standard Method of Fire Endurance Tests of Building Construction and Materials*, in their entirety, without modifications.

The IBC’s Chapter 7 Prescriptive and Calculated Fire-Resistance are based on this same premise found in ASTM E119, UL 263 and CAN/ULC-S101. The ratings were determined based on testing full-scale, loaded assemblies. If there is a load expected in the building where the beams or horizontal assemblies are to exist, using an assembly tested without a load is a violation of the requirements of the code, the standard and the listing. This violation could result in premature failure of the assembly, and possible building collapse.

The standards do contain an exception to requirement to test floor-ceilings and roof-ceilings with the maximum design load. However, if tested in this manner without a load, the resulting report and listing is required to clearly specify the assembly was tested without a load. These assemblies are rare but do have applications such as to hide cables or pipes above the assembly. These assemblies are NEVER intended to be used in a load bearing application.

ASTM E119, UL 263 Acceptance Criteria

The ASTM E119 or UL 263 fire-resistance acceptance criteria is the same for beams and horizontal assemblies – and no matter what method is chosen for fire-resistance proof, fire testing, calculated or prescriptive methods – it must support a load, with lots of weight.

- **ASTM E119 / UL 263 ACCEPTANCE CRITERIA FLOOR/CEILING, ROOF/CEILINGS**
 - o Support a load under fire-test conditions.
 - o No flaming on assembly non-fire side.
 - o Temperature Rise restriction 250°F / 325°F on the non-fire side
 - o Max avg. beam temp. 1000°F, max individual point beam temp. 1300°F, for 1 hr or ½ the rating period for a Restrained Rating, or for the full rating period for an Unrestrained Rating.
 - o ample Size – MINIMUM 12’ in any dimension, MINIMUM 180 SF total - also known as LARGE SCALE.

- **ASTM E119 / UL 263 ACCEPTANCE CRITERIA FOR BEAMS**
 - o Support a Load Applied during fire test conditions.
 - o Sample Size - MINIMUM 12’, aka LARGE SCALE.
 - o Max avg. beam temp. 1000°F, max individual point beam temp. 1300°F, for 1 hr or ½ the rating period for a Restrained Rating, or for the full rating period for an Unrestrained Rating

SUMMARY

For Fire-Resistance-Rated Assemblies, temperature, furnace size and loads are critical to successful building performance under fire-conditions. Know that if a fireproofing product thickness in a proposal is significantly thinner than anticipated, it's likely the ratings were established on an assembly tested on a small-scale furnace or tested without a load having been applied. Small scale assemblies do not sag under load.

Ask the question – was this assembly tested LARGE-SCALE, with a LOAD APPLIED in accordance with the acceptance criteria of ASTM E119 or UL 263?

If yes, OK as long as all other requirements are met. *If not, that's when to say NO to a submittal.*

Why? Fireproofing is for fire and life safety, and preventing progressive collapse of buildings due to structural failure under load and the heat of fire-conditions.

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