

Flame Spread and Fire Endurance: Surface Coatings

In the National Building Code of Canada (NBCC), “Fire-resistance rating” is defined in part as: “the time in minutes or hours that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria...”. The test and acceptance criteria the NBCC (section 3.1.7.1) refers to are contained in a standard fire test method, CAN/ULC-S101 (ASTM E-119), Standard Method of Fire Endurance Tests of Building Construction and Materials, published by Underwriters Laboratories of Canada, or by prescriptive methods (Component Additive Method). Below is a photo of the fire exposure within an accredited laboratory furnace, during a standard CAN/ULC-S101 wood assembly fire endurance test.



Photograph 1: Fire Assembly Endurance Test

The flame-spread rating is defined as the propagation of the flame along a surface. Canadian building codes require that building materials and assemblies be evaluated to CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies to demonstrate compliance with the requirements in the building codes. The flame-spread rating and smoke developed classification for different surface materials (unfinished or coated) are shown in Appendix D-3 of the NBCC, Division B. The level of NBCC requirements for flame-spread ratings is relative to the importance of a space as a means of escape. The more essential the space is as a link to safety for a greater number of occupants in the building, the more restrictive the requirements. Flame spread classification is applicable only to exposed building products within the interior of a structure. Photograph 2 below shows a typical flame spread test.



Photograph 2: Flame Spread Test



It should be noted that flame spread is only a surface measurement and cannot be used to determine the fire endurance of a structural component. The fire resistance of an I-joist floor assembly is based on exposure within the severe conditions of the CAN/ULC-S101 test and not flame spread.

Currently there are several coatings that are being promoted in the marketplace, touting fire endurance. Further inspection shows that some of these products have only flame spread ratings with no documented fire endurance. A common marketing tactic is to show a fire comparison of coated wood versus uncoated wood being exposed to a hand-held propane torch. These demonstrations may show a non-standardized amount of flame resistance but are definitely not representative of a fire assembly test or typical structure fire. Before any fire coating product is considered, its corresponding evaluation report shall be reviewed by the project's design professional(s) of record for the necessary fire endurance and ratings.