Fire-resistance classifications

by **James R. Kirby, AIA**

Q: *What do the fire-resistance classifications A, B and C mean in reference to roofing materials?*

A: Fire-resistance classifications measure roof assemblies' relative resistances to *external* fire exposures. Building codes cite these classifications to establish minimum fire-resistance requirements for different types of buildings and structures. To determine its classification, a product or roof assembly usually must be independently tested using the fire-resistance capacity tests stated in a building code.

ANSI/UL 790, "Tests for Fire Resistance of Roof Covering Materials," and ASTM E 108, "Standard Test Methods for Fire Tests of Roof Coverings," are the fire-resistance capacity tests used to determine a product's or roof assembly's classification. Both standards essentially use the same test methods; therefore, products and roof assemblies successfully tested in accordance with *either* standard result in Class A, B or C ratings.

Each standard includes an intermittent-flame exposure test, spread-of-flame test, burning-brand test, flying-brand test and rain test. The test or combination of tests required to determine classification varies for each product or roof assembly.

For example, to determine the fire-resistance classification of a product or roof system that is restricted for use on noncombustible decks (e.g., steel, concrete, gypsum), only the spread-of-flame test is required. However, a product or roof system that can be used on a combustible deck (e.g., wood) must be subjected to the spread-of-flame test, as well as the intermittent-flame and burning-brand tests.

The flying-brand test only is required when there is a possibility that pieces of a product or roof assembly (e.g., a wood roof covering over spaced sheathing) could fall into a building and add to combustion on the floor below. Rain tests are required when the fire-retardant characteristics of a product or roof assembly, such as a coated, smooth-surfaced roof system, could be affected adversely by water.

Fire-resistance classifications A, B and C are intended to represent different levels of fire-resistance performance. They are defined by ANSI/UL 790 and ASTM E 108 as follows:

- Class A roof coverings are not readily flammable, are effective against severe fire exposures, and do not carry or communicate (i.e., spread) fire.
- Class B roof coverings are not readily flammable, are effective against moderate fire exposures, and do not readily carry or communicate fire.
- Class C roof coverings are not readily flammable, are effective against light fire exposures, and do not readily carry or communicate fire.

A product or roof assembly is assigned a classification based on the fire-resistance tests it completes successfully. For example, to determine a Class A rating with the burning-brand test, a 12- by 12- by 2¼-inch (305- by 305- by 55-mm) gridded configuration consisting of three tiers of 12 12-inch- (305-mm-) long wood strips is placed on top of a test sample while air is forced over the brand. The brand is allowed to burn—not longer than 1½ hours—until it self-extinguishes or the roof assembly fails.

The same process is used to determine a Class B rating, but a 6- by 6- by 2¼-inch (150- by 150- by 55-mm) gridded configuration consisting of three tiers of six 6-inch- (150-mm-) long wood strips is used instead.

For a Class C rating, a test sample is subjected to a 1½- by 1½- by 25/32-inch (38- by 38- by 20-mm) block of wood with one saw kerf on the wood block's top and bottom faces.

Fire-resistance classifications also are used by model building codes. *Uniform Building Code, 1997 Edition,* prescribes minimum roof classifications in Table 15-A, "Minimum Roof Classes," based on occupancy and construction types. Roof classifications are A, B, C, noncombustible or nonrated; Class A, B and C roofs are tested in accordance with ANSI/UL 790.

The BOCA [Building Officials and Code Administrators International Inc.] *National Building Code/1999* describes roof classifications in Section 1506, "Fire Classification," and establishes minimum roof classifications based on construction type. Class A, B and C roofs are tested in accordance with ASTM E 108.

Standard Building Code, 1999 Edition, describes roof classifications in Section 1505, "Fire Classification," and Class A, B and C roofs are tested in accordance with ASTM E 108 or ANSI/UL 790.

Class A, B and C ratings are for *external* fire resistance of a product or roof assembly—they have no direct bearing on hourly fire ratings. Hourly fire ratings are for a roof/ceiling assembly's integrity when a fire occurs inside a building.

Essentially, fire-resistance classifications are required for all products or roof assemblies used in commercial and residential buildings. A roofing contractor should be aware of model building codes' minimum requirements when not using Class A products or roof assemblies. PR

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