

This issue of TechNotes was written by Bob Upson, M.S.F.P.E., Manager of Engineering Services.

“Limited Combustibles”

The term “limited-combustible” first turned up among the list of definitions in **NFPA 13** in the 1991 edition. The definition has been fine tuned a few times since then, most recently in the 2010 edition, but the general meaning has stayed consistent with its original source, **NFPA 220**, *Standard on Types of Building Construction*, all the way back in 1975. Nonetheless, the issue of whether or not a particular building material can be described as limited-combustible is a regular question for **NFSA**’s Expert of the Day program.

What Does Limited-Combustible Mean?

In practical terms, determining that a material qualifies as limited-combustible typically means that it can be treated the same way it would be treated if it were noncombustible. This has some important benefits in the **NFPA 13** installation standard – particularly when it comes to certain concealed spaces where sprinklers are permitted to be omitted as per **8.15.1.2.1***.

8.15.1.2.1* Concealed spaces of noncombustible and limitedcombustible construction with minimal combustible loading having no access shall not require sprinkler protection.

All in all, the installation requirements in Chapter 8 have over two dozen requirements that include references to limited-combustible materials. The limited-combustible definition found in the current edition of the standard, 2016, has been the same since 2010 following at least three minor adjustments in succession in the prior editions:

3.3.16* Limited-Combustible (Material). Refers to a building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), where tested in accordance with NFPA 259, and includes either of the following: (1) materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm) that has a flame spread index not greater than 50; or (2) materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E 84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard Test Method of Surface Burning Characteristics of Building Materials*.

A.3.3.16 Limited-Combustible (Material). Material subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition is considered combustible.
See NFPA 259 and NFPA 220.

In other words, a material must meet all the following requirements to be deemed limited-combustible:

1. It does not meet the definition of noncombustible;

Materials that meet the definition of noncombustible under **ASTM E 136**, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C (~1400°F)* do not need to be investigated to see if they meet the limited-combustible definition.

2. It has a potential heat value of 3500 BTU/pound or less when tested in accordance with **NFPA 259**;

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, is a laboratory test designed to determine the amount of heat that can potentially be given off by building materials exposed to a heat source of about 1400°F (~750°C). To be considered limited-combustible, the amount of heat potentially released must be comparatively low.

3. It must meet comply with one of the following when tested in accordance with **ASTM E 84** or **ANSI/UL 723**;
 - a. For materials with a structural base of noncombustible material, a combustible surfacing of 1/8 of an inch or less is permissible as long as it has a flame spread index of 50 or less, *OR*
 - b. A combustible material with a flame spread index of 25 or less with no evidence of continued progressive combustion when exposed by cutting through in any plane.

ASTM E 84 and **ANSI/UL 723** are essentially just slightly different versions of the same test commonly known as the “Steiner tunnel test”. This test provides a flame spread index (FSI) comparing the extent of flame spread across the surface of the test material to a standard scale where asbestos-cement board has a FSI of zero and red oak boards have a value of 100. Noncombustible materials with combustible surface coatings, such as common gypsum board, are permitted a FSI of 50 or less. Composite combustible materials with low potential heat values, such as certain fire resistance rated acoustical ceiling tiles, are permitted a FSI of up to 25.

Qualifying as limited-combustible will typically allow a material to be treated the same throughout the installation standards as if it were noncombustible but, remember, documentation must be made available to the AHJ proving that the material in question meets the definition in the form and condition that it is to be used.

Materials That Cannot Be Qualified as Limited-Combustible

With so much to gain by qualifying a material as limited-combustible, it is desirable to have a product qualified this way. However, this can also cause users to want to stretch the definition to include the product in question. Here are three commonly encountered examples of materials that *cannot* be considered limited-combustible.

Surface Coatings – Surface treatments of fire retardants or intumescent paints cannot be used on combustible materials, such as wood structural members or membranes, to create a limited-combustible material for the purposes of **8.15.1.2.1***. The only permissible approach that resembles this strategy is found in **8.15.1.2.10** which permits sprinklers to be omitted if otherwise combustible concealed spaces are lined with rigid materials meeting requirements similar, but more strict, than defined for limited-combustible materials.

8.15.1.2.10 Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less, and the materials have been demonstrated not to propagate fire more than 10.5 ft (3.2 m) when tested in accordance with ASTM E84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed, shall not require sprinkler protection.

Fire Retardant-Treated Wood (FRTW) – Wood products simply cannot be qualified as limited-combustible for the purpose of requirements like **8.15.1.2.1***. Even if a wood product with a low flame spread index is used, the potential heat of even FRTW is inevitably greater than 3500 BTU/pound. The good news is that there are *other* provisions and *other* qualifying tests that can provide the same benefit, such as **8.15.1.2.11***. (It should be noted that this also only applies only to **NFPA 701** pressure-treated FRTW applications and not to simple surface coatings.)

8.15.1.2.11* Concealed spaces in which the exposed materials are constructed entirely of fire retardant–treated wood as defined by NFPA 703 shall not require sprinkler protection.

Flame-Resistant Fabric – New in the 2016 edition of the standard, flame resistant fabric overlays meeting the requirements of **NFPA 701** are permitted alongside limited-combustible materials and FRTW to permit sprinklers to be omitted under certain exterior projections as per **8.15.7.2***. However, this allowance does not work both ways – flame-resistant fabric overlays qualified under **NFPA 701** are *not* permissible as a limited-combustible material in other parts of the standard.

8.15.7.2* Sprinklers shall be permitted to be omitted where the exterior canopies, roofs, porte-cocheres, balconies, decks, and similar projections are constructed with materials that are noncombustible, limited-combustible, or fire retardant–treated wood as defined in NFPA703, or where the projections are constructed utilizing a noncombustible frame, limited-combustibles, or fire retardant-treated wood with an inherently flame-resistant fabric overlay as demonstrated by Test Method 2 in accordance with NFPA 701.

Knowing that a material qualifies as limited-combustible can have a significant effect on sprinkler layout options. *Assuming* that a material is limited-combustible and finding out during plan review that it is *not* can result in costly revisions – even more costly if it is not caught until construction has begun! Whenever a limited-combustible material is used, it is important to check the appropriate documentation carefully for compliance and to be sure that it is included as part of the plan submittal for the AHJ’s review. When in doubt, always remember to go back to the standard and check the definition!