

Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, as indicated in 10.2.3.1.1. Materials meeting the acceptance criteria in 10.2.3.2 are permitted to be used wherever a Class A, Class B, or Class C material is required as described in 10.2.3.1.2. Alternatively, flame spread and smoke development characteristics can be both quantified and recorded in the results of a test conducted in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, as described in 10.2.3.3. The test is also commonly referred to as the “Steiner tunnel test” (named after its inventor, Al Steiner, who developed the test at Underwriters Laboratories in 1944) and, generically, as the “tunnel test.”

N 10.2.3.1 Interior Wall and Ceiling Finish Materials Tested in Accordance with NFPA 286.

N 10.2.3.1.1 Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286 and comply with 10.2.3.2.

N 10.2.3.1.2 Materials tested in accordance with 10.2.3.1.1 and complying with 10.2.3.2 shall be considered also to comply with the requirements of a Class A, Class B, or Class C in accordance with 10.2.3.3.

Paragraph 10.2.3.1.2 permits materials that meet the criteria specified in 10.2.3.2, where tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*,¹⁰ to be used as both interior wall finish and interior ceiling finish, even where other Code provisions require interior wall and ceiling finish to be Class A in accordance with 10.2.3.3. Testing per NFPA 286, combined with performance criteria specified by 10.2.3.2, represents an improvement over testing in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*,¹¹ or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*,¹² and classification in accordance with 10.2.3.3. ASTM E84 and ANSI/UL 723 test a sample that is mounted in a horizontal orientation to cover the 18 in. (455 mm) wide by 24 ft (7.3 m) long ceiling of the test tunnel. NFPA 286 tests a sample that fully covers three walls of the 8 ft (2440 mm) wide by 12 ft (3660 mm) long by 8 ft (2440 mm) high test chamber — and the ceiling as well if the results are to be applied to interior ceiling finish. See the commentary following 10.2.3.2.

Note that 10.2.3.1.2 does not require testing per NFPA 286; rather, it offers this test procedure as an alternative to that of meeting the Class A classification criteria of 10.2.3.3, based on results from the more traditional ASTM E84 or ANSI/UL 723 test protocol.

N 10.2.3.2 Acceptance Criteria for NFPA 286. The interior finish shall comply with the following:

- (1) During the 40 kW exposure, flames shall not spread to the ceiling.
- (2) The flame shall not spread to the outer extremity of the sample on any wall or ceiling.

- (3) Flashover, as described in NFPA 286, shall not occur.
- (4) The peak heat release rate throughout the test shall not exceed 800 kW.
- (5) For new installations, the total smoke released throughout the test shall not exceed 1000 m².

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, was developed specifically to measure the following:

1. Extent of flame spread and burning relative to the realistically sized and mounted sample
2. Whether flashover occurs
3. Peak rate of heat release
4. Total smoke released throughout the test

The peak heat release rate of 800 kW, as specified by 10.2.3.2(4), was new to the 2006 edition of the Code. It was added because 10.2.3.1.2 permits materials that meet the criteria specified in 10.2.3.2, where tested in accordance with NFPA 286, to be used as both interior wall finish and interior ceiling finish, even where other Code provisions require interior wall and ceiling finish to be Class A in accordance with 10.2.3.3. Some interior finish materials can be produced less expensively, so as to be somewhat less fire safe if they need to meet only the criteria of 10.2.3.2 (based on testing per NFPA 286) without a peak heat release rate criterion, instead of having to pass the flame spread criteria for Class A required by 10.2.3.3 (based on testing per ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*). The peak heat release rate criterion associated with testing per NFPA 286 helps equalize the anomaly in the test methods.

Materials that meet the criteria for Class A interior finish when tested per ASTM E84 or ANSI/UL 723, and that do not flashover the test room when tested per NFPA 286, typically have a peak heat release rate of less than 400 kW. The 800 kW peak heat release rate criterion of 10.2.3.2(4) was chosen to help ensure that materials that have already been tested are not unnecessarily penalized.

The test room used for NFPA 286 testing is the same size as that used for NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*,¹³ testing. If the test results are to be applied only to interior wall finish, then the test specimens are mounted to cover fully both 8 ft × 12 ft (2440 mm × 3660 mm) walls and the 8 ft × 8 ft (2440 mm × 2440 mm) rear wall. If the test results are to be applied both to interior wall finish and interior ceiling finish, then, in addition, the test specimen is mounted to cover the ceiling. If the test results are to be applied only to interior ceiling finish, then the test specimen is mounted to cover the ceiling only.

N 10.2.3.3* Interior Wall and Ceiling Finish Materials Tested in Accordance with ASTM E84 or ANSI/UL 723. Interior wall and ceiling finish materials shall be classified in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building*

Materials, or ANSI/UL 723, *Standard Test Method for Surface Burning Characteristics of Building Materials*, except as indicated in 10.2.3.4 and 10.2.3.5, and shall be grouped in the following classes in accordance with their flame spread and smoke developed indexes.

Class A: Flame spread index 0–25; smoke developed index 0–450.

Class B: Flame spread index 26–75; smoke developed index 0–450.

Class C: Flame spread index 76–200; smoke developed index 0–450.

▲ A.10.2.3.3 It has been shown that the method of mounting interior finish materials usually affects actual performance. The use of standard mounting methods will be helpful in determining appropriate fire test results. Where materials are tested in intimate contact with a substrate to determine a classification, such materials should be installed in intimate contact with a similar substrate. Such details are especially important for “thermally thin” materials. For further information, see ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*.

Some interior wall and ceiling finish materials, such as fabrics not applied to a solid backing, do not lend themselves to a test made in accordance with ASTM E84. In such cases, the large-scale test outlined in NFPA 701 is permitted to be used. In 1989 the NFPA Technical Committee on Fire Tests eliminated the so-called “small-scale test” from NFPA 701 because the results had been shown not to represent a fire performance that corresponded to what happened in real scale. Since then, NFPA 701 no longer contains a “small-scale test” but it now contains two tests (Test 1 and Test 2), which apply to materials as a function of their areal density. Thus NFPA 701 Test 1 applies to fabrics (other than vinyl-coated fabric blackout linings) having an areal density less than or equal to 21 oz/yd² (700 g/m²), while NFPA 701 Test 2 applies to fabrics with an areal density greater than 21 oz/yd² (700 g/m²), vinyl-coated fabric blackout linings, decorative objects, and films. Representations that materials or products have been tested to the small-scale test in NFPA 701 normally refer to the pre-1989 small-scale test, which no longer exists and which does not represent acceptable fire performance.

Prior to 1978, the test report described by ASTM E84 included an evaluation of the fuel contribution as well as the flame spread index and the smoke developed index. However, it is now recognized that the measurement on which the fuel contribution is based does not provide a valid measure. Therefore, although the data are recorded during the test, the information is no longer normally reported. Classification of interior wall and ceiling finish thus relies only on the flame spread index and smoke developed index.

The 450 smoke developed index limit is based solely on obscuration. (See A.10.2.4.4.)

▲ 10.2.3.3.1 Existing interior finish shall be exempt from the smoke developed index criteria of 10.2.3.3.

Samples are tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, as mandated by 10.2.3.3, using a noncombustible, fiber cement board backing. Specimens are tested with adhesives and joints and under other conditions that simulate the actual installation of a product in a building. These fire test standards provide a general indication of product performance

only if the product is installed in a fashion similar to that which has been tested. Available data demonstrate that the performance of interior finish materials varies, depending on mounting conditions.¹⁴ For example, a product installed over a combustible substrate tends to propagate fire more readily than would be typical of the same product installed over a noncombustible substrate.

Further, a wall covering installed with air space behind the covering tends to spread flame more readily than one installed in contact with a noncombustible substrate. Therefore, mounting techniques must be carefully considered in the evaluation of probable product performance.

Exhibit 10.2 illustrates the ASTM E84 room tunnel test apparatus. The same apparatus is required for testing per ANSI/UL 723.

Exhibit 10.2



ASTM E84 room tunnel test apparatus. (Photo courtesy of Herbert Blenstein)

Interior wall and ceiling finish classifications in accordance with 10.2.3.3 are based mainly on flame spread indices, with an additional requirement that the smoke developed index not exceed a common value of 450, regardless of the class into which the material falls based on flame spread. Flame spread classifications offer a general indication of the speed with which fire might spread across the surface of a material. In assessing the hazard posed by a material on the basis of flame spread, it is assumed that a person might be close to the fire and would be directly exposed to the energy associated with the actual flames. By contrast, the purpose of the smoke developed index is to address visual obscuration of the egress path by smoke. Thus, an interior wall and ceiling finish material with a low smoke developed index should provide better visibility in a given egress route than a material with a relatively high smoke developed index. Given that the smoke developed index is a cumulative measurement over the prescribed test duration, it is based on both quantity and rate of smoke liberation.

The Code requires the use of specific classes of interior wall and ceiling finish materials, which are differentiated by their

allowable flame spread index, based on consideration of their installed location within the building, the building's egress paths, and the occupancy in question. Different classes of interior finish materials are specified for an office area, for example, as opposed to an exit stair enclosure or exit access corridor. The different classes recognize that, when escaping a building, people must move away from the flames while traveling through the means of egress toward an exit. The classes of interior finishes that are considered acceptable within an open office, therefore, are different from those that are required for exit enclosures. Similarly, occupancies used by those who have decreased capabilities of self-preservation have stricter interior finish requirements than occupancies used by fully ambulatory occupants. For example, although both hospitals and hotels provide sleeping accommodations, interior finish requirements for hospitals are more stringent, because hospital patients are less capable of self-preservation.

The same smoke developed index limit is used for all three flame spread classifications. This limit recognizes that smoke generated during a fire might affect visibility both in the vicinity of, and remote from, the fire. Large buildings can be quickly filled with smoke as a result of a fire. An upper limit has been established, therefore, that applies to new interior finish materials, regardless of their location.

Per 10.2.3.3.1, existing wall and ceiling finish materials are exempted from the smoke development limitation. In existing buildings, existing interior finish materials are restricted only on the basis of flame spread. Prior to the 1976 edition, the *Code* did not regulate interior finish materials based on smoke development. As a general rule, the replacement of existing materials only because they were previously approved exclusively on the basis of flame spread is not warranted.

The smoke developed index limit of 450 was determined on the basis of research conducted by Underwriters Laboratories Inc. A 5000 ft³ (140 m³) room equipped with illuminated exit signs was filled with smoke from the tunnel test chamber. The time required to reach various stages of exit sign obscuration was recorded and compared to the smoke developed indices for the different materials involved. The report states that "materials having smoke developed ratings above 325 showed 'good' to 'marginal' visibility — scale readings of 3 to 4.8 — in a few cases; other materials produced conditions of 'marginal' to obscuration in the six-minute period."¹⁵

Considering both time and smoke levels, the limit of 450 on smoke development as used in the *Code* has been judged to be reasonable. There is no direct relationship between flame spread and smoke development. For example, in the report referenced in the preceding paragraph, one material had a flame spread index of 490 and a smoke developed index of 57, while another had a flame spread index of 44 and a smoke developed index of 1387.

The smoke development limit of 450 is based solely on the level of visual obscuration. Although not addressed by the requirements for interior finishes, other important factors used in evaluating materials on the basis of smoke generation are the

effects of irritability and toxicity caused by gases. Smoke might also act as an irritant, further reducing visibility, and might, in addition, have a debilitating physiological effect on people attempting to escape from a building. Such effects are not evaluated by the current smoke development limit. Earlier editions of the *Code* permitted the authority having jurisdiction to regulate products presenting an "unreasonable life hazard due to the character of the products of decomposition." This provision was deleted in the 1988 edition of the *Code* due to its unenforceable nature. The adverse physiological effects on the human body caused by exposure to heat and the effects of inhaling hot gases should also be considered as part of an overall hazard risk assessment and should be considered separately from the interior finish requirements of Section 10.2.

N 10.2.3.3.2 The classification of interior finish specified in 10.2.3.3 shall be that of the basic material used by itself or in combination with other materials.

N 10.2.3.3.3 Wherever the use of Class C interior wall and ceiling finish is required, Class A or Class B shall be permitted, and where Class B interior wall and ceiling finish is required, Class A shall be permitted.

Paragraph 10.2.3.3.3 recognizes that the *Code* sets minimum criteria. An interior finish material that performs better than that specifically prescribed by the *Code* is always permitted.

N 10.2.3.4 Materials complying with the requirements of 10.2.3.1 shall not be required to be tested in accordance with 10.2.3.3.

N 10.2.3.5 Materials described in 10.2.4 shall be tested as described in the corresponding sections.

N 10.2.4* Interior Wall and Ceiling Finish Materials with Special Requirements. The materials indicated in 10.2.4.1 through 10.2.4.16 shall be tested as indicated in the corresponding sections.

Δ A.10.2.4 Surface nonmetallic raceway products, as permitted by *NFPA 70* are not interior finishes and are not subject to the provisions of Chapter 10.

10.2.4.1 Thickness Exemption. The provisions of 10.2.1.1 shall not apply to materials having a total thickness of less than 1/28 in. (0.9 mm) that are applied directly to the surface of walls and ceilings where both of the following conditions are met:

- (1) The wall or ceiling surface is a noncombustible or limited combustible material.
- (2) The materials applied meet the requirements of Class A interior wall or ceiling finish when tested in accordance with 10.2.3, using fiber cement board as the substrate material.

Paragraph 10.2.4.1 addresses the issue of thin coverings, which was covered in earlier editions of the *Code* by a simply worded, performance-based criterion that was difficult to use and enforce. The *Code* recognized that thin coverings [those less than 1/28 in. (0.9 mm) in thickness] with surface-burning characteristics not greater than that of paper would not significantly affect the fire performance of the basic wall or ceiling material. If assurance were provided that such a thin covering had

surface-burning characteristics not greater than those of paper, the thin material would not be subject to regulation as an interior finish. Therefore, the material's flame spread rating wasn't needed, which, in turn, meant that no fire testing was required. The problem was that, without running fire tests, it was impossible to determine whether a thin material had surface-burning characteristics that were greater than those of paper.

The wording of 10.2.4.1 does not exempt newly installed thin materials from testing, but it does exempt thin materials from testing with the actual substrate or backing material that will be used in the final installed state, provided that the material is installed on a noncombustible or limited-combustible surface (e.g., gypsum wallboard). If there were no exemption, thin materials, such as paint (whose liquid suspension state dries to become a thin layer of material) and wallpaper, would be required to be fire tested in combination with numerous backing materials. A complete set of test results, representative of the many forms of substrates in common use, would be prohibitively expensive to collect. Paragraph 10.2.4.1 permits the material to be tested only with fiber cement board as the substrate material. If the material, where tested in that configuration, meets the requirements for Class A interior finish (see 10.2.3.3), no further regulation by Section 10.2 is required.

Thermally thin coverings, such as paint and wallpaper coverings, where secured to a noncombustible substrate such as fiber cement board, will not significantly alter the performance of the substrate during a fire. However, thicker coverings, such as multiple layers of wallpaper, can contribute to rapid fire growth. For example, multiple layers of wall coverings contributed to rapid fire growth in the multiple-death fire in the Holiday Inn in Cambridge, Ohio, which occurred on July 31, 1979.¹⁶

The provision of 10.2.4.1 has the effect of requiring any wall or ceiling covering (or multiple layers of such covering) of more than $\frac{1}{28}$ in. (0.9 mm) in thickness to undergo the full test series required of other interior finish materials so as to be representative of actual installations. Painted surfaces might be evaluated using the steps that follow:

1. Determine the classification of the interior finish material (e.g., wood wainscoting) in its unpainted configuration and verify that it complies with the applicable limits (e.g., 38.3.3, if the occupancy is new business, 7.1.4 for exit enclosures).
2. Obtain a paint product for which the manufacturer has documented that it achieves a Class A rating when applied to a substrate of cement fiber board and tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.
3. Apply the paint to the substrate described in step 1 such that the thickness is less than $\frac{1}{28}$ in. (0.9 mm).
4. Where steps 1 through 3 are followed, the paint is exempt from being tested on the substrate on which it is actually installed.

Where the thickness of an interior finish material is $\frac{1}{28}$ in. (0.9 mm) or greater, it must be tested as it will actually be installed. For example, the performance of thermally thin coverings is altered by the nature of the substrate over which they are installed.¹⁷ Adhesives might also be an important factor in performance. In the case of composites (such as textile wall coverings over gypsum board), the adhesive should be sufficient to maintain a bond between the "finish" and the substrate. However, excess adhesive might contribute to a fire. Tests of textile wall coverings have shown that changing adhesives or simply changing the application rate for the same adhesive might significantly alter product performance.¹⁸ Tests to qualify assemblies should use adhesives and application rates similar to actual installations.

Similarly, a product that undergoes testing in intimate contact with a mineral board should be installed in contact with a mineral board or similar substrate. Also, where products are tested in intimate contact with a substrate, results might be altered if the product is installed with air space behind the covering.

N 10.2.4.1.1 If a material having a total thickness of less than $\frac{1}{28}$ in. (0.9 mm) is applied to a surface that is not noncombustible or not limited-combustible, the provisions of 10.2.3 shall apply.

N 10.2.4.1.2 Approved existing installations of materials applied directly to the surface of walls and ceilings in a total thickness of less than $\frac{1}{28}$ in. (0.9 mm) shall be permitted to remain in use, and the provisions of 10.2.3 shall not apply.

- The provision of 10.2.4.1.2 exempts existing interior wall and ceiling finish materials having a thickness of less than $\frac{1}{28}$ in. (0.9 mm) from the testing requirements of 10.2.3, provided that they are acceptable to the authority having jurisdiction. See the definition of *approved existing* in 3.3.84.1. The intent of the exemption is to permit existing finishes, such as a single layer of paint or wallpaper, to remain in place without documentation of its flame spread characteristics, since determination of its classification might be impractical. It is expected that such finish materials have a finite service life, and, upon replacement, tested products can be applied or installed. Where the AHJ determines that the finish material is of such character that regulation is necessary, use of the exemption provided by 10.2.4.1.2 can be denied.

Δ 10.2.4.2* Exposed Portions of Structural Members. In other than new interior exit stairways, new interior exit ramps, and new exit passageways, exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with NFPA 220 or with the building code shall be exempt from testing and classification in accordance with 10.2.3.

N A.10.2.4.2 Paragraph 10.2.4.2 does not require Type IV (2HH), heavy timber, other than that used in interior exit stairs, interior exit ramps, and exit passageways be tested by either ASTM E84 or ANSI/UL 723 to determine a flame spread rating. Taller wood buildings and new technology, primarily new "mass timber," make taller buildings of Type IV

possible. To that end, the requirements for Type IV have been changed to require the testing for components in the egress system such that they too need to be tested and meet the appropriate classification required in this section. This means that Type IV is “presumed” to comply with the finish requirements in this section for the purpose of meeting the requirements of this section for any wall or ceiling finish of elements other than interior exit stairways, interior exit ramps, and exit passageways.

Type IV(2HH) construction has traditionally been called “heavy timber construction.” Exposed surfaces of the structural members, such as wood columns, beams, and girders, meet the definition of interior wall and ceiling finish. All heavy timber structural members are required to be of substantial thickness, as detailed in NFPA 220, *Standard on Types of Building Construction*,¹⁹ and NFPA 5000®, *Building Construction and Safety Code*®.²⁰ Thus, none are thermally thin, so they do not present the concerns addressed in the commentary that follows 10.2.1.2.

Paragraph 10.2.4.2 recognizes that exposed surfaces of heavy timber structural members can be safely used where Class A, Class B, or Class C interior wall and ceiling finish is required in other than exit enclosures, as explained in A.10.2.4.2, which is new to the 2018 edition of the Code. Such wood members often have flame spread indices in the range of 76 to 200 and, therefore, are typically classified as Class C interior finish. The exemption is based on the fact that the structural members are located at intervals and do not constitute a continuous surface that allows flame to spread, for example, across a ceiling.

10.2.4.3 Cellular or Foamed Plastic.

N 10.2.4.3.1 Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.2 or 10.2.4.3.4.

N 10.2.4.3.2 The requirements of 10.2.4.3 shall apply both to exposed foamed plastics and to foamed plastics used in conjunction with a textile or vinyl facing or cover.

Δ 10.2.4.3.3* Cellular or foamed plastic materials shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics for the use intended under actual fire conditions.

A.10.2.4.3.3 See A.10.2.4.3.3.2.

Δ 10.2.4.3.3.1 One of the following fire tests shall be used for assessing the combustibility of cellular or foamed plastic materials as interior finish:

- (1) NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, with the acceptance criteria of 10.2.3.2
- (2) ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material* (including smoke measurements, with total smoke release not to exceed 1000 m²)
- (3) ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*
- (4) ANSI/FM Approval 4880, *Approval Standard for Class I Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems*

N 10.2.4.3.3.2* The tests shall be performed on a finished foamed plastic assembly related to the actual end-use configuration, including any cover or facing, and at the maximum thickness intended for use.

A.10.2.4.3.3.2 Both NFPA 286 and ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*, contain smoke obscuration criteria. ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, and FM 4880, *Approval Standard for Class I Insulated Wall or Wall and Roof/Ceiling Panels; Plastic Interior Finish Materials; Plastic Exterior Building Panels; Wall/Ceiling Coating Systems; Interior or Exterior Finish Systems*, do not. Smoke obscuration is an important component of the fire performance of cellular or foamed plastic materials.

N 10.2.4.3.4 Cellular or foamed plastic shall be permitted for trim not in excess of 10 percent of the specific wall or ceiling area to which it is applied, provided that it is not less than 20 lb/ft³ (320 kg/m³) in density, is limited to ½ in. (13 mm) in thickness and 4 in. (100 mm) in width, and complies with the requirements for Class A or Class B interior wall and ceiling finish as described in 10.2.3.3; however, the smoke developed index shall not be limited.

The prohibition of 10.2.4.3.1 on the use of foamed plastics within buildings is based on actual fire experience in which foamed plastics have contributed to very rapid fire development.²¹ It also acknowledges that tunnel testing per ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials* (see 10.2.3.4), might not accurately assess the potential hazard of plastics in general. Therefore, if cellular or foamed plastics are to be used within a building, their use needs to be substantiated on the basis of large-scale fire tests that simulate conditions of actual use. Four such tests are offered in 10.2.4.3.3.1(1) through (4).

Note that the provisions of 10.2.4.3 apply not only to exposed foamed plastics but also to foamed plastics used as backings for textile or vinyl facings or cover materials. An assembly comprising foamed plastic backings in conjunction with a textile or vinyl facing or cover is expected to behave differently under fire tests than if just the textile or vinyl facing were tested alone.

Paragraph 10.2.4.3.4 permits the limited use of cellular or foamed plastics as a substitute for traditional wood trim, assuming their performance under fire exposure will be comparable to that of wood. To control the mass of the material that can be used, limits have been established on width and thickness. The intent in establishing a minimum density of 20 lb/ft³ (320 kg/m³) is to prohibit the use of lightweight [1 lb/ft³ to 3 lb/ft³ (16 kg/m³ to 48 kg/m³)], readily available, foamed plastics as trim.

Limiting plastic trim to Class A or Class B materials, in combination with the 10 percent area limit for walls and ceilings, imposes a greater restriction than that which applies to wood. This limitation ensures that the performance of the plastic trim will be equivalent or superior to that of more traditional materials.

In establishing the 10 percent limit, it is intended that the trim will be used around doors and windows or at the junction of walls and ceilings. Therefore, the trim will be somewhat uniformly distributed throughout the room. There would be a significant difference in the probable performance of wall and

ceiling finish if the 10 percent limit were concentrated in one area.

N 10.2.4.4* Textile Wall Coverings. Where used as interior wall finish materials, textile materials shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of either, 10.2.3.1, 10.2.4.4.1, or 10.2.4.4.3.

Δ A.10.2.4.4 Previous editions of the *Code* have regulated textile materials on walls and ceilings using ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*. Full-scale room/corner fire test research has shown that flame spread indices produced by ASTM E84 or ANSI/UL 723 might not reliably predict all aspects of the fire behavior of textile wall and ceiling coverings.

NFPA 265 and NFPA 286, both known as room/corner tests, were developed for assessing the fire and smoke obscuration performance of textile wall coverings and interior wall and ceiling finish materials, respectively. As long as an interior wall or ceiling finish material is tested by NFPA 265 or NFPA 286, as appropriate, using a mounting system, substrate, and adhesive (if appropriate) that are representative of actual use, the room/corner test provides an adequate evaluation of a product's flammability and smoke obscuration behavior. Manufacturers, installers, and specifiers should be encouraged to use NFPA 265 or NFPA 286, as appropriate (but not both), because each of these standard fire tests has the ability to characterize actual product behavior, as opposed to data generated by tests using ASTM E84 or ANSI/UL 723, which only allow comparisons of one product's performance with another. If a manufacturer or installer chooses to test a wall finish in accordance with NFPA 286, additional testing in accordance with ASTM E84 or ANSI/UL 723 is not necessary.

The test results from ASTM E84 or ANSI/UL 723 are suitable for classification purposes but should not be used as input into fire models, because they are not generated in units suitable for engineering calculations. Actual test results for heat, smoke, and combustion product release from NFPA 265, and from NFPA 286, are suitable for use as input into fire models for performance-based design.

N 10.2.4.4.1* Products tested in accordance with NFPA 265 shall comply with the criteria of 10.2.4.4.2.

Δ A.10.2.4.4.1 The methodology specified in NFPA 265 includes provisions for measuring smoke obscuration.

N 10.2.4.4.2* The interior finish shall comply with all of the following when tested using method B of the test protocol of NFPA 265:

- (1) During the 40 kW exposure, flames shall not spread to the ceiling.
- (2) The flame shall not spread to the outer extremities of the samples on the 8 ft × 12 ft (2440 mm × 3660 mm) walls.
- (3) Flashover, as described in NFPA 265, shall not occur.
- (4) For new installations, the total smoke released throughout the test shall not exceed 1000 m².

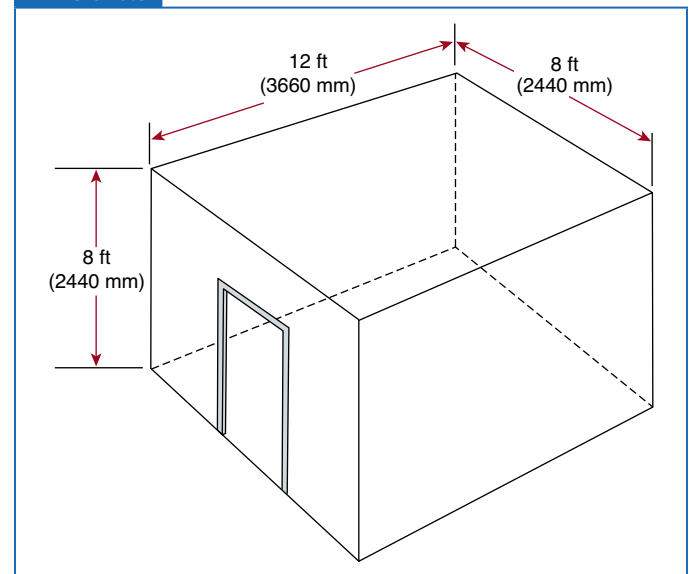
A.10.2.4.4.2 See A.10.2.4.4.1 and A.10.2.4.4.

The *Code* recognizes the use of Method B of NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*, but not Method A. Method B is the more rigorous test

and requires that the test specimens be mounted to cover fully both 8 ft × 12 ft (2440 mm × 3660 mm) walls and the 8 ft × 8 ft (2440 mm × 2440 mm) rear wall. Method A is a screening test for which the test specimen is mounted as 24 in. (610 mm) wide strips at the intersection of two adjacent walls and along the top of those two walls where they meet the ceiling.

The NFPA 265 test compartment is depicted in Exhibit 10.3.

Exhibit 10.3



Test compartment required by NFPA 265.

N 10.2.4.4.3 Textile materials meeting the requirements of Class A when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard Test Method for Surface Burning Characteristics of Building Materials*, using the specimen preparation and mounting method of ASTM E2404, *Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics*, shall be permitted as follows:

- (1) On the walls of rooms or areas protected by an approved automatic sprinkler system.
- (2) On partitions that do not exceed three-quarters of the floor-to-ceiling height or do not exceed 8 ft (2440 mm) in height, whichever is less.
- (3) On the lower 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions.
- (4) Previously approved existing installations of textile material meeting the requirements of Class A when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* or ANSI/UL 723, *Standard Test Method for Surface Burning Characteristics of Building Materials*, shall be permitted to be continued to be used.

The provisions addressing textile wall coverings were editorially reorganized for user-friendliness to the 2018 edition of the *Code*; no technical changes were intended. Textile materials are

permitted to be used as interior wall finish only where such materials meet 10.2.3.1, 10.2.4.4.1, or 10.2.4.4.3.

Prior to the 1988 edition of the *Code*, the danger of carpetlike textile coverings used on walls and ceilings was recognized and regulated by a requirement that only Class A tufted or napped materials be used, even in a sprinklered building. In 1981, eight people died at the nonsprinklered Las Vegas Hilton Hotel when a fire began in an elevator lobby and was fueled by carpetlike textile wall and ceiling finishes that did not meet the qualifications for Class A interior finish.²² Other than the textile wall and ceiling finish materials, sheer sunscreen material at the window, and a cushioned seat pad on a metal bench, little combustible material was present to fuel the fire in the elevator lobby, an example of which is depicted in Exhibit 10.4. Yet, the elevator lobby went to flashover, the fire broke out the windows and extended to a nearly identical elevator lobby on the floor above, and the events repeated themselves in a leapfrog fashion, burning out the elevator lobbies from the eighth floor through the twenty-fourth floor. See Exhibit 10.5.

Exhibit 10.4



Las Vegas Hilton elevator lobby with carpetlike textile wall and ceiling finish material.

Exhibit 10.5



Resulting fire spread involving elevator lobbies on eighth through twenty-fourth floors.

Research sponsored by the American Textile Manufacturers Institute (ATMI) and conducted by the Fire Research Laboratory of the University of California at Berkeley between March 1985 and January 1986 is described in the report "Room Fire Experiments of Textile Wall Coverings."²³ This research demonstrated that consideration of only the flame spread index, as measured by ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, might not reliably predict the fire behavior of textile wall and ceiling coverings. Test results indicate that not all Class A textile wall coverings are alike with respect to their potential for producing room flashover; some are capable of producing room flashover when subjected to an ignition source scenario that models a small fuel item (such as a wastebasket) igniting a chair or similar furnishing, while others are not. Simply requiring textile wall coverings to be classified as Class A does not ensure the level of life safety intended by the *Code*.

The testing at the University of California was conducted in an 8 ft × 12 ft × 8 ft high (2440 mm × 3660 mm × 2440 mm high) room using a gas diffusion burner as an ignition source. Products undergoing evaluation — various textile wall coverings — were applied to the walls; the gas diffusion burner and ignition source were placed in the corner of the room. Two of the 16 products tested — one a tufted wall covering, the other a woven wall covering — were known to have flame spread ratings of 25 or less when tested in accordance with ASTM E84 or ANSI/UL 723. When tested using the room-corner procedure, these two products readily spread flame and caused the fire in the test room to grow quickly to a large size, causing full room involvement — that is, flashover. Concerns about the performance of such low flame spread textile wall coverings led to the requirement of 10.2.4.4.1 for full-scale room-corner testing to qualify products for use in nonsprinklered buildings.

The tests revealed that the method of mounting, including adhesive and application rate, can be critically important to product fire performance. Changing the application rate of the same adhesive or changing the adhesive can cause a product that is assumed to be safe to exhibit unsatisfactory performance.

Caution should be exercised where combinations of textile wall and ceiling coverings are installed. Experience has shown that combinations of textile wall and ceiling coverings might result in intense burning. The University of California testing included only wall coverings; research conducted at the Illinois Institute of Technology Research Institute indicates that flame spread is more likely to occur with combinations of combustible wall and ceiling coverings than in those situations involving only combustible wall coverings or only combustible ceiling coverings.²⁴ Therefore, full-scale room-corner testing, using an appropriately sized ignition source, is necessary to substantiate the performance of textile wall and ceiling coverings.

NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall*

Coverings on Full Height Panels and Walls, serves as a nationally recognized room-corner fire test to be used specifically for textile wall coverings. Its use is addressed in 10.2.4.4.1.

Paragraph 10.2.3.1 expands the options for specialized fire tests representative of an actual installation by recognizing the use of NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*. See the commentary that follows 10.2.3.1.2.

Paragraph 10.2.4.4.3 addresses other conditions under which textile wall coverings are permitted to be used.

- N 10.2.4.5* Expanded Vinyl Wall Coverings.** Where used as interior wall finish materials, expanded vinyl wall coverings shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of either 10.2.3.1, 10.2.4.4.1, or 10.2.4.4.3.

A.10.2.4.5 Expanded vinyl wall covering consists of a woven textile backing, an expanded vinyl base coat layer, and a nonexpanded vinyl skin coat. The expanded base coat layer is a homogeneous vinyl layer that contains a blowing agent. During processing, the blowing agent decomposes, which causes this layer to expand by forming closed cells. The total thickness of the wall covering is approximately 0.055 in. to 0.070 in. (1.4 mm to 1.8 mm).

The provisions of 10.2.4.5, which address expanded vinyl wall coverings, are similar to those of 10.2.4.4, which are applicable to textile wall coverings. It is the intent of the *Code* to require compliance with 10.2.4.5 wherever expanded vinyl wall finish materials are installed, regardless of occupancy classification.

- N 10.2.4.6 Textile Ceiling Coverings.** Where used as interior ceiling finish materials, textile materials shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall meet one of the following:

- (1) Comply with the requirements of 10.2.3.1
- (2) Meet the requirements of Class A when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* or ANSI/UL 723, *Standard Test Method for Surface Burning Characteristics of Building Materials* using the specimen preparation and mounting method of ASTM E2404, *Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics*, and used on the ceilings of rooms or areas protected by an approved automatic sprinkler system

- N 10.2.4.7 Expanded Vinyl Ceiling Coverings.** Where used as interior ceiling finish materials, expanded vinyl materials shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall meet one of the following:

- (1) Comply with the requirements of 10.2.3.1
- (2) Meet the requirements of Class A when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* or ANSI/UL 723, *Standard Test Method for Surface Burning Characteristics of Building Materials*, using the specimen preparation and mounting method of ASTM E2404, *Standard Practice for Specimen Preparation and*

Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics, and used on the ceilings of rooms or areas protected by an approved automatic sprinkler system

N 10.2.4.8 Lockers.

- N 10.2.4.8.1 Combustible Lockers.** Where lockers constructed of combustible materials other than wood are used, the lockers shall be considered interior finish and shall comply with 10.2.3, except as permitted by 10.2.4.8.2.

- N 10.2.4.8.2 Wood Lockers.** Lockers constructed entirely of wood and of noncombustible materials shall be permitted to be used in any location where interior finish materials are required to meet a Class C classification in accordance with 10.2.3.

N 10.2.4.9 Solid Thermoplastics.

- N 10.2.4.9.1** Solid thermoplastics including, but not limited to, polypropylene, high-density polyethylene (HDPE), solid polycarbonate, solid polystyrene, and solid acrylic materials that melt and drip when exposed to flame shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1.

- N 10.2.4.9.2** The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

Polypropylene (PP) and high-density polyethylene (HDPE) are thermoplastic materials that, when exposed to fire, have a tendency to melt and form pool fires that can potentially burn vigorously. The requirements of 10.2.4.9 specify that products, such as toilet room privacy dividers constructed of PP or HDPE, are considered interior finish materials and must comply with the performance criteria of 10.2.3.1 when tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*. Testing such materials for their flame spread and smoke development characteristics using the tunnel test of ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, does not sufficiently characterize their fire performance. The NFPA 286 room-corner test provides a more realistic determination of their contribution to fire development in a room.

N 10.2.4.10 Site-Fabricated Stretch Systems.

- N 10.2.4.10.1** For new installations, site-fabricated stretch systems containing all three components described in the definition in Chapter 3 shall be tested in the manner intended for use and shall comply with the requirements of 10.2.3.1 or 10.3.7.

- N 10.2.4.10.2** If the materials are tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, specimen preparation and mounting shall be in accordance with ASTM E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*.

Site-fabricated stretch systems comprise three components as described in the definition in 3.3.284.2:

1. A frame (constructed of plastic, wood, metal, or other material) used to hold fabric in place
2. A core material (infill, with the correct properties for the application)
3. An outside layer, comprising a textile, fabric, or vinyl, that is stretched taut and held in place by tension or mechanical fasteners via the frame

Although many authorities having jurisdiction might have previously regulated site-fabricated stretch systems, such as the fabric wall depicted in Exhibit 10.6, as interior finish, the requirements of 10.2.4.10 make it clear that such systems are, in fact, interior finish, and must be tested accordingly. Additionally, where such systems are tested using the Steiner tunnel test in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, they must be mounted in the tunnel using the procedure specified by ASTM E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*.²⁵

Exhibit 10.6



Example of a site-fabricated stretch system. (Photo courtesy of Novawall® Systems, Inc.)

N 10.2.4.11 Reflective Insulation Materials.

- N 10.2.4.11.1** Reflective insulation materials shall be tested in the manner intended for use and shall comply with the requirements of 10.2.3 or 10.2.3.3.
- N 10.2.4.11.2** If the materials are tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, specimen preparation and mounting shall be in accordance with ASTM E2599, *Standard Practice for Specimen Preparation and Mounting of Reflective Insulation, Radiant Barrier, and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics*.

N 10.2.4.12 Metal Ceiling and Wall Panels.

- N 10.2.4.12.1** Listed factory finished metal ceiling and wall panels meeting the requirements of Class A in accordance with 10.2.3, shall be permitted to be finished with one additional application of paint.
- N 10.2.4.12.2** Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed $\frac{1}{8}$ in. (0.9 mm).

Metal-based ceiling and wall panels are used extensively in custom-designed acoustical ceiling and wall systems. Often the customer desires a special custom color to meet aesthetic requirements. Although the manufacturer can certify the performance of the factory finish, it is not possible to test and certify all the custom colors that are requested. These finishes are applied post-production, using a process whereby thickness of paint application is controlled. The $\frac{1}{8}$ in. (0.9 mm) thickness criterion used in 10.2.4.12.2 is taken from 10.2.4.1 as a safe thickness for which the exemption does not sacrifice safety.

N 10.2.4.13 Laminated Products Factory Produced with a Wood Substrate.

- N 10.2.4.13.1** Laminated products factory produced with a wood substrate shall be tested in the manner intended for use and shall comply with the requirements of 10.2.3.1 or 10.2.3.3.
- N 10.2.4.13.2** If the materials are tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, specimen preparation and mounting shall be in accordance with ASTM E2579, *Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics*, using the product-mounting system, including adhesive, of actual use.

N 10.2.4.14 Facings or Wood Veneers Intended to be Applied on Site over a Wood Substrate.

- N 10.2.4.14.1** Facings or veneers intended to be applied on site over a wood substrate shall be tested in the manner intended for use and shall comply with the requirements of 10.2.3.1 or 10.2.3.3.
- N 10.2.4.14.2** If the materials are tested in accordance with NFPA 286 they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286.

- N 10.2.4.14.3** If the materials are tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, specimen preparation and mounting shall be in accordance with ASTM E2404, *Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics*.

Paragraphs 10.2.4.13 and 10.2.4.14 are new to the 2018 edition of the Code. Paragraph 10.2.4.13.2 specifies the mounting method found in ASTM E2579, *Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface*

Burning Characteristics,²⁶ for factory produced laminated products with a wood substrate when tested using the Steiner tunnel in accordance with 10.2.3.3. It has been shown that when veneers are applied over a wood substrate, the resulting flame spread can be much higher than that when applied over gypsum wall-board or a noncombustible substrate. ASTM E2579 requires the test to be performed with the full factory produced assembly, eliminating the need to retest for different substrates. Paragraph 10.2.4.14.3 specifies the mounting method found in ASTM E2404, *Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics*,²⁷ for facings or wood veneers intended to be applied over a wood substrate when tested using the Steiner tunnel. Both systems are also permitted to be tested using NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, via the references to 10.2.3.1 in 10.2.4.13.1 and 10.2.4.14.1.

▲ **10.2.4.15* Light-Transmitting Plastics.** Light-transmitting plastics shall be permitted based on large-scale fire tests per 10.2.4.3.3.1, which substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions.

▲ **A.10.2.4.15** Light-transmitting plastics are used for a variety of purposes, including light diffusers, exterior wall panels, skylights, canopies, glazing, and the like. Previous editions of the *Code* have not addressed the use of light-transmitting plastics. Light-transmitting plastics will not normally be used in applications representative of interior finishes. Accordingly, ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, can produce test results that might or might not apply.

Light-transmitting plastics are regulated by model building codes such as NFPA 5000. Model building codes provide adequate regulation for most applications of light-transmitting plastics. Where an authority having jurisdiction determines that a use is contemplated that differs from uses regulated by model building codes, light-transmitting plastics in such applications can be substantiated by fire tests that demonstrate the combustibility characteristics of the light-transmitting plastics for the use intended under actual fire conditions.

For additional information on light transmitting plastics, see Section 48.7 of NFPA 5000.

Paragraph 10.2.4.15 was revised for the 2018 edition of the *Code* to correlate with the requirements of NFPA 5000, *Building Construction and Safety Code*. See Chapter 48 of NFPA 5000 for additional guidance.

10.2.4.16 Decorations and Furnishings. Decorations and furnishings that do not meet the definition of interior finish, as defined in 3.3.95.2, shall be regulated by the provisions of Section 10.3.

10.2.5 Trim and Incidental Finish.

10.2.5.1 General. Interior wall and ceiling trim and incidental finish, other than wall base in accordance with 10.2.5.2 and bulletin boards, posters, and paper in accordance with 10.2.5.3, not in excess of 10 percent of the specific wall and ceiling areas of any room or space to which

it is applied shall be permitted to be Class C materials in occupancies where interior wall and ceiling finish of Class A or Class B is required.

▲ **10.2.5.2 Wall Base.** Interior floor trim material used at the junction of the wall and the floor to provide a functional or decorative border, and not exceeding 6 in. (150 mm) in height, shall meet the requirements for interior wall finish for its location or the requirements for Class II interior floor finish as described in 10.2.7.4 using the test described in 10.2.7.3.

▼ **10.2.5.2.1** If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards, Posters, and Paper.

10.2.5.3.1 Bulletin boards, posters, and paper attached directly to the wall shall not exceed 20 percent of the aggregate wall area to which they are applied.

▲ **10.2.5.3.2** The provision of 10.2.5.3.1 shall not apply to artwork and teaching materials in sprinklered educational or day-care occupancies in accordance with 14.7.4.3(2), 15.7.4.3(2), 16.7.4.3(2), or 17.7.4.3(2).

Subsection 10.2.5 is intended to permit the use of wood trim around doors and windows as a decoration or as functional molding (such as for chair rails). Wood trim must meet the criteria for Class C materials. See 10.2.4.3.4 for restrictions applicable to plastic trim. Where such trim is used in rooms or spaces requiring the use of Class A or Class B materials, the trim is permitted to constitute not more than 10 percent of the aggregate wall or ceiling area to ensure that the trim will be more or less uniformly distributed throughout the room or space. If the trim is concentrated in a single, sizable, continuous pattern (e.g., on one wall of a room), the materials could contribute to rapid fire growth.

The wall base provisions of 10.2.5.2 regulate the common practice of running flooring up onto the lowest portion of a wall where it meets the floor. The 6 in. (150 mm) maximum height criterion recognizes the limitations of judging an interior wall finish material based on a test method developed to evaluate flame spread for interior floor finish materials exposed to a flaming radiant heat source. Note that, even where the interior floor finish of a room or space is not required to be Class I or Class II in accordance with 10.2.7.4, the flooring material wrapped up onto the wall is required to be tested and classified per 10.2.7.3 and 10.2.7.4.

The educational and day-care occupancy chapters have regulated artwork and teaching materials that are attached directly to walls for many editions of the *Code* — see 14.7.4.3, 15.7.4.3, 16.7.4.3, and 17.7.4.3. The provisions of 10.2.5.3 codify the subject for all other occupancies. Bulletin boards, posters, and paper attached directly to a wall serve as de facto interior finish materials with the potential for spreading flame. The 20 percent maximum aggregate wall area criterion of 10.2.5.3.1 helps ensure that there are not sufficient expanses of such materials, for which classification per 10.2.3.3 is unfeasible and unenforceable, that could spread flame more quickly than would occur with wall finish materials complying with applicable interior finish requirements based on testing per ASTM E84,

Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

10.2.6* Fire-Retardant Coatings.

A.10.2.6 Fire-retardant coatings need to be applied to surfaces properly prepared for the material, and application needs to be consistent with the product listing. Deterioration of coatings applied to interior finishes can occur due to repeated cleaning of the surface or painting over applied coatings.

▲ **10.2.6.1*** The required flame spread index or smoke developed index of existing surfaces of walls, partitions, columns, and ceilings shall be permitted to be secured by applying approved fire-retardant coatings to surfaces having higher flame spread index values than permitted.

▲ **A.10.2.6.1** It is the intent of the *Code* to mandate interior wall and ceiling finish materials that obtain their fire performance and smoke developed characteristics in their original form. However, in renovations, particularly those involving historic buildings, and in changes of occupancy, the required fire performance or smoke developed characteristics of existing surfaces of walls, partitions, columns, and ceilings might have to be secured by applying approved fire-retardant coatings to surfaces having higher flame spread ratings than permitted. Such treatments should comply with the requirements of NFPA 703. When fire-retardant coatings are used, they need to be applied to surfaces properly prepared for the material, and application needs to be consistent with the product listing. Deterioration of coatings applied to interior finishes can occur due to repeated cleaning of the surface or painting over applied coatings, but permanency must be assured in some appropriate fashion. Fire-retardant coatings must possess the desired degree of permanency and be maintained so as to retain the effectiveness of the treatment under the service conditions encountered in actual use.

■ **10.2.6.1.1** Such treatments shall be tested, or shall be listed and labeled for application to the material to which they are applied, and shall comply with the requirements of NFPA 703.

10.2.6.2* Surfaces of walls, partitions, columns, and ceilings shall be permitted to be finished with factory-applied fire-retardant-coated products that have been listed and labeled to demonstrate compliance with the requirements of ASTM E2768, *Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials*, on the coated surface.

A.10.2.6.2 The intent of this section is that factory-applied fire-retardant-coated products, such as panels or tiles applied to walls or ceilings, replace the existing finish and are not applied on top of the existing finish.

10.2.6.3 Fire-retardant coatings or factory-applied fire-retardant-coated assemblies shall possess the desired degree of permanency and shall be maintained so as to retain the effectiveness of the treatment under the service conditions encountered in actual use.

Fire-retardant paints, coatings, and penetrants are sometimes used to improve the flame spread ratings of materials or assemblies used as interior finishes within buildings. Fire-retardant treatments are permitted to be used to satisfy the flame spread requirements only for existing interior finish materials within existing buildings.

Fire retardants are generally surface treatments that — through intumescence or other chemical reaction — will delay the ignition and slow the flame spread of a material. The nature of the material to which the treatment has been applied is not changed. Fire exposures of sufficient duration or intensity can ultimately cause a treated material to burn. Therefore, as a rule, materials with favorable intrinsic performance characteristics are preferred over those that achieve a satisfactory level of performance through the use of externally applied treatments. However, external treatments, where properly applied and maintained, can be effective in achieving reasonable fire performance.

Note that 10.2.6.1.1 permits fire-retardant coatings to be either tested or listed, as the product might have been tested with adequate results but not yet listed when being considered for application. Additionally, such products must comply with NFPA 703, *Standard for Fire Retardant-Treated Wood and Fire-Retardant Coatings for Building Materials*,²⁸ which contains criteria related to testing.

Fire-retardant paints, coatings, and penetrants must be applied in strict accordance with the manufacturer's instructions. Most fire-retardant coatings require an application rate that is three to four times greater than that of ordinary paints. Application is usually done by brush, spray, immersion, or pressure treatment. The treatment should be reapplied or renewed at regular intervals. Treatments that might be removed by regular maintenance, washing, or cleaning procedures will require periodic examination and reapplication to maintain the required level of performance.

The use of fire retardants can improve the performance of some materials from Class C to Class B; similarly, Class B materials can, in some cases, be upgraded to Class A. Likewise, materials having flame spread ratings in excess of 200 can sometimes be upgraded to Class C.

In approving fire-retardant treatments, the authority having jurisdiction should take into consideration that, in reducing flame spread, some fire-retardant treatments increase a material's capacity for smoke generation.

The provision of 10.2.6.2 is intended to permit assemblies with factory-applied coatings, provided that they are listed and labeled by an approved testing laboratory to indicate compliance with the noted test standard.

10.2.7* Interior Floor Finish Testing and Classification.

A.10.2.7 The flooring radiant panel provides a measure of a floor covering's tendency to spread flames when located in a corridor and exposed to the flame and hot gases from a room fire. The flooring radiant panel test method is to be used as a basis for estimating the fire performance of a floor covering installed in the building corridor. Floor coverings in open building spaces and in rooms within buildings merit no further regulation, provided that it can be shown that the floor covering is at least as resistant to spread of flame as a material that meets the U.S. federal flammability standard 16 CFR 1630, "Standard for the Surface Flammability of Carpets and Rugs" (FF 1-70). All carpeting sold in the United States since 1971 is required to meet this standard and, therefore,