1. Delete the reference in Sections 2.2 and 2.4 as follows:


2. Delete 3.3.49 and A.3.3.49 as follows:

   **3.3.49 Barricade.** A natural or artificial barrier that effectively screens a magazine, building, railway, or highway from the effects of an explosion in a magazine or building containing explosives. [1124, 2013]

   **A.3.3.49 Barricade.** Barricades designed and constructed in accordance with TM 5-1300/AEM 88-22/NAVFAC P-397, Structures to Resist the Effects of Accidental Explosions, are used in circumstances where the building itself is designed to contain the explosive effects. Free standing barriers can also be constructed to meet these requirements.

3. Delete 3.3.125 as follows:

   **3.3.125 Consumer Fireworks, 1.4G.** See 3.3.243.1.

4. Revise 3.3.243 to read as follows:

   **3.3.243 Fireworks.** Any composition or device for the purpose of producing a visible or an audible effect by combustion, deflagration, or detonation, and that meets the definition of Consumer Fireworks, 1.4G, or Display Fireworks, 1.3G, as set forth in this Code.

5. Delete 3.3.243.1 and A.3.3.243.1 as follows:

   **3.3.243.1 Consumer Fireworks, 1.4G.** Consumer Fireworks, 1.4G contain limited quantities of pyrotechnic composition per unit and therefore are not required to be stored in a magazine. Consumer Fireworks, 1.4G are normally classed as Explosive, 1.4G and described as Fireworks UN0336 by the U.S. Department of Transportation (U.S. DOT). (See Annex C of NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.)

6. Revise 3.3.243.2 and A.3.3.243.2 to read as follows:

   **3.3.243.2 Display Fireworks, 1.3G.** Display Fireworks, 1.3G contain limited quantities of pyrotechnic composition per unit and therefore are not required to be stored in a magazine. Display Fireworks, 1.3G are normally classed as Explosive, 1.3G and described as Fireworks UN0336 by the U.S. Department of Transportation (U.S. DOT). (See Annex C of NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.)
A.3.3.243.2 Display Fireworks, 1.3G. Display Fireworks, 1.3G are described as Fireworks UN0335 and classed as Explosive. 1.3G by the U.S. Department of Transportation (U.S. DOT). (See Annex C of NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.)

7. Delete 3.3.526 as follows:

3.3.526 Pyrotechnic Article. A pyrotechnic device, other than a device classed as fireworks, for use in the entertainment industry. [1124, 2013]

8. Revise 6.3.2.4.4 to read as follows:

6.3.2.4.4 High Hazard Level 3 Contents. High hazard Level 3 contents shall include materials that readily support combustion or present a physical hazard including, but not limited to, the following:

(1) Level 2 and Level 3 aerosols
(2) Class I, Class II, or Class III-A flammable or combustible liquids that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103 kPa)
(3) Consumer Fireworks, 1.4G
(3) Flammable solids, other than dusts classified as high hazard Level 2, stored, used, or generated in a manner creating a high fire hazard
(4) Class II and Class III organic peroxides
(5) Class 2 solid or liquid oxidizers
(6) Class 3 solid or liquid oxidizers that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103 kPa)
(7) Oxidizing gases and oxidizing cryogenic liquids
(8) Class 2 unstable (reactive) materials
(9) Class 2 water-reactive materials

9. Delete 6.4.2.25 as follows:

6.4.2.25 Fireworks and Pyrotechnic Articles Facilities. Buildings in which fireworks and pyrotechnic articles are manufactured, stored, or sold at retail, and magazines in which fireworks, 1.1 and fireworks, 1.3 are stored, shall be constructed in accordance with NFPA 4124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.

10. Revise A.3.3.407.3 to read as follows:

A.3.3.407.3 Explosive Material. The term explosive material includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters, and Display Fireworks, 1.3G (Class B, Special). The term explosive includes any material determined to be within the scope of Title 18, United States Code, Chapter 40, and also includes any material classified as an explosive other than Consumer Fireworks, 1.4G (Class C, Common), by the Hazardous Materials Regulations of the U.S. Department of Transportation (DOT) in 49 CFR.

The former classification system used by DOT included the terms high explosive and low explosive, as further defined in A.3.3.407.3.2. These terms remain in use by the U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives. Explosive materials classified as hazard Class 1 are further defined under the current system applied by DOT. Compatibility group letters are used in concert with division numbers to specify further limitations on each division noted. For example, the letter G (as in
1.4G) identifies substances or articles that contain a pyrotechnic substance and similar materials. UN/DOT Class 1 Explosives are defined as follows:...

11. Delete the reference in H.1.1 as follows:

**NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles, 2013 edition.**

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### Additional Proposed Changes

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### Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 15-2 (Log 1139) issued by the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitter’s Substantiation: Deletes reference to NFPA 1124, or a consumer fireworks provision, or both. Consistent with NFPA Standards Council Decision D#14-1, issued March 3, 2014, NFPA has temporarily withdrawn NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles. The effect of this decision is that no recognized criteria for the subjects previously governed by NFPA 1124 exist within the NFPA codes and standards system; thus, this TIA works to align NFPA 5000 with that circumstance.

Emergency Nature: NFPA 1124 has been temporarily withdrawn as a result of Standards Council Decision D#14-1, which was issued March 3, 2014, subsequent to completion of the NFPA 5000-2015 Second Draft, but prior to the issuance of NFPA 5000-2015. Accordingly, this TIA is intended to be issued concurrently with NFPA 5000-2015.

### Submitter Information Verification

**Submitter Full Name:** TC ON BLD-FUN

**Organization:** NFPA TC on Fundamentals

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Mar 09 10:47:26 EDT 2015

### Committee Statement

**Resolution:** The text related to consumer fireworks was removed, via TIAs in time for the printing of the 2015 edition of NFPA 5000, as NFPA 1124 had been withdrawn by the Standards Council. The technical committee restates its understanding that the 2018 edition of the Code will not contain provisions related to consumer fireworks as NFPA 1124 does not exist.
Reference: Various
TIA 15-2
(SC 14-8-35 / TIA Log #1139)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Delete the reference in Sections 2.2 and 2.4 as follows:


2. Delete 3.3.49 and A.3.3.49 as follows:

3.3.49 Barricade. A natural or artificial barrier that effectively screens a magazine, building, railway, or highway from the effects of an explosion in a magazine or building containing explosives. [1124, 2013]

A.3.3.49 Barricade. Barricades designed and constructed in accordance with TM 5 1300/AFM 88-22/NAVFAC P-397, Structures to Resist the Effects of Accidental Explosions, are used in circumstances where the building itself is designed to contain the explosive effects. Free standing barriers can also be constructed to meet these requirements.

3. Delete 3.3.125 as follows:

3.3.125 Consumer Fireworks, 1.4G. See 3.3.243.1.

4. Revise 3.3.243 to read as follows:

3.3.243 Fireworks. Any composition or device for the purpose of producing a visible or an audible effect by combustion, deflagration, or detonation, and that meets the definition of Consumer Fireworks, 1.4G, or Display Fireworks, 1.3G, as set forth in this Code.

5. Delete 3.3.243.1 and A.3.3.243.1 as follows:

3.3.243.1 Consumer Fireworks, 1.4G. (Formerly known as Class C, Common Fireworks.) Any small-fireworks device designed primarily to produce visible effects by combustion that complies with the construction, chemical composition, and labeling regulations of the U.S. Consumer Product Safety Commission, as set forth in Title 16, CFR, Parts 1500 and 1507. Some small devices designed to produce audible effects are included, such as whistling devices, ground devices containing 0.8 gr (50 mg) or less of explosive composition (salute powder), and aerial devices containing 2 gr (130 mg) or less of explosive composition (salute powder) per explosive unit.
A.3.3.243.1 Consumer Fireworks, 1.4G. Consumer Fireworks, 1.4G contain limited quantities of pyrotechnic composition per unit and do not pose a mass explosion hazard where stored. Therefore, they are not required to be stored in a magazine. Consumer Fireworks, 1.4G are normally classed as Explosive, 1.4G and described as Fireworks UN0336 by the U.S. Department of Transportation (U.S. DOT). (See Annex C of NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.)

6. Revise 3.3.243.2 and A.3.3.243.2 to read as follows:

3.3.243.2* Display Fireworks, 1.3G. (Formerly known as Class B, Special Fireworks.) Large fireworks articles designed to produce visible or audible effects for entertainment purposes by combustion, deflagration, or detonation. This term includes, but is not limited to, salutes containing more than 2 gr (130 mg) of explosive composition (salute powder) and aerial shells containing more than 60 g (2.1 oz) of total pyrotechnic and explosive composition, and other display pieces that exceed the limits for classification as Consumer Fireworks, 1.4G.

A.3.3.243.2 Display Fireworks, 1.3G. Display Fireworks, 1.3G are described as Fireworks UN0335 and classed as Explosive, 1.3G by the U.S. Department of Transportation (U.S. DOT). (See Annex C of NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.)

7. Delete 3.3.526 as follows:

3.3.526 Pyrotechnic Article. A pyrotechnic device, other than a device classed as fireworks, for use in the entertainment industry. [1124, 2013]

8. Revise 6.3.2.4.4 to read as follows:

6.3.2.4.4 High Hazard Level 3 Contents. High hazard Level 3 contents shall include materials that readily support combustion or present a physical hazard including, but not limited to, the following:
1. Level 2 and Level 3 aerosols
2. Class I, Class II, or Class III-A flammable or combustible liquids that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103 kPa)
3. Consumer Fireworks, 1.4G
4. Flammable solids, other than dusts classified as high hazard Level 2, stored, used, or generated in a manner creating a high fire hazard
5. Class II and Class III organic peroxides
6. Class 2 solid or liquid oxidizers
7. Class 3 solid or liquid oxidizers that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103 kPa)
8. Oxidizing gases and oxidizing cryogenic liquids
9. Class 2 unstable (reactive) materials
10. Class 2 water-reactive materials

9. Delete 6.4.2.25 as follows:

6.4.2.25 Fireworks and Pyrotechnic Articles Facilities. Buildings in which fireworks and pyrotechnic articles are manufactured, stored, or sold at retail, and magazines in which fireworks, 1.1 and fireworks, 1.3 are stored, shall be constructed in accordance with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.
10. Revise A.3.3.407.3 to read as follows:

A.3.3.407.3 Explosive Material. The term explosive material includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters, and Display Fireworks, 1.3G (Class B, Special). The term explosive includes any material determined to be within the scope of Title 18, United States Code, Chapter 40, and also includes any material classified as an explosive other than Consumer Fireworks, 1.4G (Class C, Common), by the Hazardous Materials Regulations of the U.S. Department of Transportation (DOT) in 49 CFR.

The former classification system used by DOT included the terms high explosive and low explosive, as further defined in A.3.3.407.3.2. These terms remain in use by the U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives. Explosive materials classified as hazard Class 1 are further defined under the current system applied by DOT. Compatibility group letters are used in concert with division numbers to specify further limitations on each division noted. For example, the letter G (as in 1.4G) identifies substances or articles that contain a pyrotechnic substance and similar materials. UN/DOT Class 1 Explosives are defined as follows….

11. Delete the reference in H.1.1 as follows:

1. Revise 7.4.1.4.5.3 to read as follows:  

7.4.1.4.5.3 Frangible Building. A frangible building containing high hazard contents requiring Protection Level 1 or Protection Level 2 shall not be required to comply with the other provisions of Section 7.4, provided that it complies with all of the following conditions:

(1) The allowable area of the frangible building is less than or equal to 400 ft² (37 m²) in floor area or the building and its use comply with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles, and the floor area does not exceed that allowed in Table 7.4.1.

(2) The frangible building is a maximum of one story in height above grade plane without any basements.

(3) The frangible building has a maximum occupant load of two people unless the building and its use comply with NFPA 1124.

(4) The frangible building is separated in accordance with Chapter 34, unless the building and its use comply with NFPA 1124.

2. Revise D.7.4.3 to read as follows:

D.7.4.3 Frangible Building. A frangible building containing high hazard contents requiring Protection Level 1 or Protection Level 2 shall not be required to comply with the other provisions of Section D.7.4, provided that it complies with all of the following conditions:

(1) The allowable area of a frangible building is less than or equal to 400 ft² (37.2 m²) in floor area, or the building and its use comply with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles, and the EF compartment area does not exceed that allowed in Table D.4.2.1(b).

(2) The frangible building is a maximum of one story without any basements.

(3) The frangible building has a maximum occupant load of two people unless the building and its use comply with NFPA 1124.

(4) The frangible building is separated in accordance with Chapter 34, unless the building and its use comply with NFPA 1124.

3. Delete H.1.1 as follows:


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Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 15-5 (Log 1142) issued by National Fire Protection Association Report [Link to NFPA Report]
the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitter’s Substantiation: Deletes reference to NFPA 1124, or a consumer fireworks provision, or both. Consistent with NFPA Standards Council Decision D#14-1, issued March 3, 2014, NFPA has temporarily withdrawn NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles. The effect of this decision is that no recognized criteria for the subjects previously governed by NFPA 1124 exist within the NFPA codes and standards system; thus, this TIA works to align NFPA 5000 with that circumstance.

Emergency Nature: NFPA 1124 has been temporarily withdrawn as a result of Standards Council Decision D#14-1, which was issued March 3, 2014, subsequent to completion of the NFPA 5000-2015 Second Draft, but prior to the issuance of NFPA 5000-2015. Accordingly, this TIA is intended to be issued concurrently with NFPA 5000-2015.

Submitter Information Verification

Submitter Full Name: TC ON BLD-BLC
Organization: NFPA TC on Building Construction
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Mar 09 15:35:14 EDT 2015

Committee Statement

Resolution: The text related to consumer fireworks was removed, via TIAs in time for the printing of the 2015 edition of NFPA 5000, as NFPA 1124 had been withdrawn by the Standards Council. The technical committee restates its understanding that the 2018 edition of the Code will not contain provisions related to consumer fireworks as NFPA 1124 does not exist.
Reference: 7.4.1.4.5.3, D.7.4.3, and H.1.1
TIA 15-5
(SC 14-8-38 / TIA Log #1142)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Revise 7.4.1.4.5.3 to read as follows:

7.4.1.4.5.3 Frangible Building. A frangible building containing high hazard contents requiring Protection Level 1 or Protection Level 2 shall not be required to comply with the other provisions of Section 7.4, provided that it complies with all of the following conditions:
(1) The allowable area of the frangible building is less than or equal to 400 ft² (37 m²) in floor area, or the building and its use comply with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles, and the floor area does not exceed that allowed in Table 7.4.1.
(2) The frangible building is a maximum of one story in height above grade plane without any basements.
(3)*The frangible building has a maximum occupant load of two people unless the building and its use comply with NFPA 1124.
(4) The frangible building is separated in accordance with Chapter 34, unless the building and its use comply with NFPA 1124.

2. Revise D.7.4.3 to read as follows:

D.7.4.3 Frangible Building. A frangible building containing high hazard contents requiring Protection Level 1 or Protection Level 2 shall not be required to comply with the other provisions of Section D.7.4, provided that it complies with all of the following conditions:
(1) The allowable area of a frangible building is less than or equal to 400 ft² (37.2 m²) in floor area, or the building and its use comply with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles, and the EF compartment area does not exceed that allowed in Table D.4.2.1(b).
(2) The frangible building is a maximum of one story without any basements.
(3) The frangible building has a maximum occupant load of two people unless the building and its use comply with NFPA 1124.
(4) The frangible building is separated in accordance with Chapter 34, unless the building and its use comply with NFPA 1124.

3. Delete H.1.1 as follows:


Issue Date: August 14, 2014
Effective Date: September 3, 2014
Public Input No. 18-NFPA 5000-2015 [ Global Input ]

1. Delete the reference in 27.4.5.3(8) as follows:

   (8) NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2. Delete 27.4.6 as follows:

   27.4.6 Retail Sales of Consumer Fireworks, 1.4G. Mercantile occupancies where the retail sales of Consumer Fireworks, 1.4G are conducted shall comply with NFPA 1124.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 15-6 (Log 1143) issued by the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitter’s Substantiation: Deletes reference to NFPA 1124, or a consumer fireworks provision, or both. Consistent with NFPA Standards Council Decision D#14-1, issued March 3, 2014, NFPA has temporarily withdrawn NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles. The effect of this decision is that no recognized criteria for the subjects previously governed by NFPA 1124 exist within the NFPA codes and standards system; thus, this TIA works to align NFPA 5000 with that circumstance.

Emergency Nature: NFPA 1124 has been temporarily withdrawn as a result of Standards Council Decision D#14-1, which was issued March 3, 2014, subsequent to completion of the NFPA 5000-2015 Second Draft, but prior to the issuance of NFPA 5000-2015. Accordingly, this TIA is intended to be issued concurrently with NFPA 5000-2015.

Submitter Information Verification

Submitter Full Name: TC ON BLD-MER
Organization: NFPA TC on Mercantile and Business Occupancies
Street Address:
City:
State:
Zip:
Submittal Date: Mon Mar 09 15:53:58 EDT 2015
Committee Statement

Resolution: TIA 15-6 issued in August 2014 deleted the referenced to NFPA 1124 in Sections 27.4.5.3(8) and 27.4.6. The TIA was issued concurrently with the publication of NFPA 5000 2015 edition, thus the text was deleted at the time of publication and does not appear in the Code. With the issuance of TIA 15-6, no additional action is needed at this time as the requested deletion has already been made.
Reference: 27.4.5.3(8) and 27.4.6
TIA 15-6
(SC 14-8-39 / TIA Log #1143)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a public input of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Delete the reference in 27.4.5.3(8) as follows:

(8) NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2. Delete 27.4.6 as follows:

27.4.6 Retail Sales of Consumer Fireworks, 1.4G. Mercantile occupancies where the retail sales of Consumer Fireworks, 1.4G are conducted shall comply with NFPA 1124.
Public Input No. 19-NFPA 5000-2015 [Global Input]

1. Delete 34.1.1.2(14) as follows:

(14) Consumer fireworks, 1.4G, in mercantile occupancies complying with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2. In Table 34.1.3.1, delete the row for “consumer fireworks.”

3. In Table 34.1.3.2(a) through Table 34.1.3.2(h), delete the row for “consumer fireworks.”

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 15-4 (Log 1141) issued by the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitter’s Substantiation: Deletes reference to NFPA 1124, or a consumer fireworks provision, or both. Consistent with NFPA Standards Council Decision D#14-1, issued March 3, 2014, NFPA has temporarily withdrawn NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles. The effect of this decision is that no recognized criteria for the subjects previously governed by NFPA 1124 exist within the NFPA codes and standards system; thus, this TIA works to align NFPA 5000 with that circumstance.

Emergency Nature: NFPA 1124 has been temporarily withdrawn as a result of Standards Council Decision D#14-1, which was issued March 3, 2014, subsequent to completion of the NFPA 5000-2015 Second Draft, but prior to the issuance of NFPA 5000-2015. Accordingly, this TIA is intended to be issued concurrently with NFPA 5000-2015.

Submitter Information Verification

Submitter Full Name: TC ON BLD-IND

Organization: NFPA TC on Industrial Storage, and Miscellaneous Occupancies

Street Address: 

City: 

State: 

Zip: 

Submittal Date: Mon Mar 09 16:09:12 EDT 2015
Committee Statement

**Resolution:** The text related to consumer fireworks was removed, via TIAs in time for the printing of the 2015 edition of NFPA 5000, as NFPA 1124 had been withdrawn by the Standards Council. The technical committee restates its understanding that the 2018 edition of the Code will not contain provisions related to consumer fireworks as NFPA 1124 does not exist.
Reference: 34.1.1.2(14), Table 34.1.3.1, and Tables 34.1.3.2(a) through (h)
TIA 15-4
(SC 14-8-37 / TIA Log #1141)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Delete 34.1.1.2(14) as follows:

(14) Consumer fireworks, 1.4G, in mercantile occupancies complying with NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2. In Table 34.1.3.1, delete the row for “consumer fireworks.”

3. In Table 34.1.3.2(a) through Table 34.1.3.2(h), delete the row for “consumer fireworks.”

Issue Date: August 14, 2014
Effective Date: September 3, 2014
1. Revise 16.4.1, from what was done by Second Revision SR-173 (Annual 2014 revision cycle – NFPA 5000 Second Draft), to read as follows:

16.4.1 Life Safety Evaluation.

16.4.1.1* General. Where a life safety evaluation is required by other provisions of this Code, it shall comply with all of the following:

(1) The life safety evaluation shall be performed by persons acceptable to the AHJ.

(2) The life safety evaluation shall include a written assessment of safety measures for conditions listed in 16.4.1.2 and of the building systems and facility management in accordance with 16.4.1.3.

(3) The life safety evaluation shall be approved annually by the AHJ and shall be updated for special or unusual conditions.

16.4.1.2 Conditions to Be Assessed. Life safety evaluations shall include an assessment of all of the following conditions and the related appropriate safety measures:

(1) Nature of the events and the participants and attendees

(2) Access and egress movement, including crowd density problems

(3) Medical emergencies

(4) Fire hazards

(5) Permanent and temporary structural systems

(6) Severe weather conditions

(7) Earthquakes

(8) Civil or other disturbances

(9) Hazardous materials incidents within and near the facility

(10) Relationships among facility management, event participants, emergency response agencies, and others having a role in the events accommodated in the facility

16.4.1.3* Building Systems and Facility Management Assessments. Life safety evaluations shall include assessments of both building systems and facility management upon which reliance is placed for the safety of facility occupants, and such assessments shall consider scenarios appropriate to the facility.

16.4.1.3.1 Building Systems. Prior to issuance of the building permit, the design team shall provide the AHJ with building systems documentation in accordance with 16.4.1.4.

16.4.1.3.2 Facility Management. Prior to issuance of the certificate of occupancy, the facility management shall provide the AHJ with facility management documentation in accordance with 16.4.1.5.

16.4.1.3.3 Life Safety Evaluation.

16.4.1.3.3.1 Prior to issuance of the building permit, the persons performing the life safety evaluation shall confirm that the building systems provide appropriate safety measures.

16.4.1.3.3.2 Prior to issuance of the certificate of occupancy, the persons performing the
The life safety evaluation shall confirm that the facility management and operational plans provide appropriate safety measures.

16.4.1.3.3 The AHJ shall determine approve the acceptable persons performing the life safety evaluation in a timely manner to enable the design team and facility management to resolve concerns to the satisfaction of the persons performing the life safety evaluation prior to their submission.

16.4.1.4 Life Safety Building Systems Document. The AHJ shall be provided with a life safety building systems document providing the information required in 16.4.1.4.2 through 16.4.1.4.4.

16.4.1.4.1 Document Distribution. The persons performing the life safety evaluation, the AHJ, the A/E design team, and the building owner shall receive a copy of the life safety building systems document prior to issuance of the building permit. 16.4.1.4.2 Life Safety Narrative. A life safety narrative shall be provided describing the following:

1. Building occupancy, construction type, and intended uses and events
2. Building area and population capacity of the proposed facility
3. Principal fire and life safety features/strategies for the building, such as including—as applicable—the following:
   (a) Egress
   (b) Access control
   (c) Fire barriers, smoke barriers, and smoke partitions
   (d) Sprinkler protection, fire suppression systems
   (e) Smoke control/protection
   (f) Fire detection and alarm—visual and audible
   (g) PA system
   (h) Emergency elevator operation
   (i) Emergency power and lighting
   (j) Provisions for patrons with disabilities
   (k) Fire department access
   (l) Fire/Emergency command center
4. Exterior construction design parameters used/applied

16.4.1.4.3 Life Safety Floor Plans. Life safety floor plans of each level shall be provided—as applicable—with the following:

1. Occupant load, exit location, exit egress capacity, main exit/entry entrance/exit, horizontal exits, travel distance, and exit discharge
2. Fire barriers, and smoke barriers, and smoke partitions
3. Areas of smoke-protected assembly occupancy
4. Separate smoke-protected areas or zones, if applicable
5. Areas of other occupancy type and separations, if required
6. Unprotected vertical openings, including atriums, communicating spaces, and convenience openings
7. Event plans for each anticipated type of event depicting the following:
   (a) Seating configuration
   (b) Exhibit booth layout
   (c) Stage location
(d) Occupant load, exit egress capacity required, exits provided, and travel distance

(e) Any floor or stage use restrictions

(f) Plan and/or section drawing indicating areas where the roof construction is more than 50 ft (15 m) above floor level and limits areas where sprinkler protection is omitted

(g) Areas of refuge — interior and exterior

16.4.1.4.4 Engineering Analysis and Calculations. An engineering analysis and calculations shall be provided with the following:

(1) Smoke protection calculations analysis to substantiate the use of smoke-protected assembly seating as follows:

(a) Performance-based design methods approved by the AHJ

(b) Smoke exhaust and fresh air control requirements per NFPA 92, Standard for Smoke Control Systems

(c) Smoke control assumptions, such as fire scenario description, fire size quantification, and smoke development/smoke movement analysis

(b) Smoke maintained at a level 6 ft above the floor of the means of egress (cd.) Proposed testing protocol for smoke control system and pass/fail criteria (d) Calculations for performance-based design methods accepted by the AHJ (e) Smoke and fire modeling

(f) Timed egress analysis and assumed flow rates and travel speeds

(g) Assumed flow rates and travel speed

(2) Sprinkler protection calculations, including an engineering analysis substantiating locations in accordance with 16.3.5.3 where sprinkler protection would be ineffective due to height and combustible loading (3) Load diagram of rigging/load capacity of gridiron, fly loft, or long-span roof structure used for hanging overhead objects

16.4.1.5 Life Safety Management Document. The AHJ shall be provided with a life safety management document providing the information required in 16.4.1.5.2 through 16.4.1.5.7.

16.4.1.5.1 Document Distribution. The persons performing the life safety evaluation, the AHJ, the A/E design team, and the building owner shall receive a copy of the life safety management document prior to issuance of the certificate of occupancy.

16.4.1.5.2 Facility Management and Operational Plans. Facility management and operational plans shall address the following:

(1) Best practices adopted or recognized

(2) Emergency plans

(3) Evacuation plans

(4) Shelter-in-place plans, including capacities and protection considerations

(5) Crowd management training plan

(6) Safety plans, which include the following:

(a) Training plans

(b) Safety equipment plans

(7) Fire alarm, smoke control system protocol, and testing plans

(8) First aid or medical treatment plans, which include the following:
(a) Defined levels of service
(b) Standing orders adopted
(c) Supply and equipment plan

(9) Housekeeping plans — biological, medical, hazardous materials cleaning

(10) Emergency communication plans, which include the following:
   (a) Chain of authority and incident command system employed
   (b) Contact information for the following:
      i. Venue personnel
      ii. Emergency management and response organizations, (e.g., such as fire, police, medical, utility, transportation, and key stakeholders)
   (c) Communication systems
   (d) Standard announcement systems for incidents or emergency situations

(11) Risk and threat assessment for venue and surrounding area for the following:
   (a) Severe weather
   (b) Hazardous materials
   (c) Terrorism
   (d) Hostile intruder

(12) Operating procedures and protocols for risks, such as the following:
   (a) Severe weather preparedness and monitoring plans
   (b) Hazardous materials incidence response plans
   (c) Terrorism response plans
   (d) Hostile intruder response plans

(13) First responder response/arrival routes plans

(14) Alcohol management plans

(15) Food safety plans

(16) Rigging and temporary performance structure, which includes the following:
   (a) Design and safety review plans
   (b) Emergency action plans

(17) Chemical and hazardous materials information and data

(18) Barrier and wall protection plans for motor sports or similar events

16.4.1.5.3 Records. Records of the facility management plans, including procedures and location, shall be maintained for the following:

   (1) Crowd management training
   (2) Safety training
   (3) Fire alarm, smoke control system maintenance, and test records
   (4) First aid or medical treatment and regulation compliance

16.4.1.5.4 Building Systems Reference Guide. A building systems reference guide shall be provided in accordance with 16.4.1.5.4.1 through 16.4.1.5.4.3.

16.4.1.5.4.1 A basic life safety building systems reference guide shall be developed and maintained.

16.4.1.5.4.2 The life safety building systems reference guide shall contain the important
and key information for the venue management’s use when planning events/activities for the safety of patrons, performers/participants, employees, and vendors.

16.4.1.5.4.3 The life safety building systems document in accordance with 16.4.1.4 shall be permitted to be used, but additionally the life safety building systems reference guide shall include the following:

1. Occupant capacity of every space/room
2. Egress flow diagrams, including assumed flow rates, and capacities of all aisles and hallways, including public and nonpublic areas
3. Capacities of all exterior doors and/or choke points in immediate perimeter areas
4. Limitations or assumptions for ingress control that could be in place during an emergency egress/evacuation, including control gates, queuing barriers, and turnstiles
5. Capacities of immediate perimeter exterior walkways, including assumed flow rates for exterior areas
6. Assumed egress paths for normal conditions — transportation modes
7. Management level (lay) sequencing charts for alarm and emergency communication systems, the manual, or override options/instructions that include the following:
   (a) List of codes or alarm signals
   (b) Location of manual overrides
   (c) Description of what exactly happens during an alarm, sequence of operations during an alarm such as exhaust fans operate or doors open
8. Principal fire and life safety features/strategies, such as sprinklers, smoke control, fire alarm notifications, PA system, emergency power, and fire department access
9. Assumptions when developing occupancy plans for venue floor, open areas, and nonevent spaces, such as the following:
   (a) Event floor plans/setup diagrams for each typical event/activity
   (b) Fire sprinkler and smoke protection capabilities
10. Severe weather shelter areas, locations, structure considerations (limitations), capacities (occupancy and density factor)
11. Command center, which includes the following: (a) Location (formal or informal)
   (b) Structural integrity considerations
   (c) Redundant locations and/or capabilities
   (d) Jurisdictional rights — assumed and/or applied
12. Locations and capacities of wheelchair and mobility-impaired seating
13. Locations and capacities of “Safe Haven” areas of refuge and other safe areas
14. Rigging or structural load capacities of grids, truss structure, fly lofts, ceilings, floors, ramps, staging, etc.
15. List of locations of emergency equipment (i.e., such as fire extinguishers, fire hose cabinets, fire hydrants, AEDs, etc.)
16. Sequencing of electrical service, such as the following:
   (a) Emergency generators and charts of all areas illuminated during power outages
   (b) Multiple electrical feed capabilities
List of mechanical, moveable equipment in the facility

Potential hazards in the surrounding neighborhood, including train tracks and propane stations

Assumptions or accommodations considered and used in design

16.4.1.5.4.4 The facility management plans shall be maintained and adjusted as necessary for changes to the venue structure, operating purposes and style, and event occupancy.

16.4.1.5.5 Facility management and operational plans shall be reviewed by the AHJ annually.

16.4.1.5.6 For events and activities at the venue that are outside the normal operating conditions or vary from the normal facility management plans, the following shall apply:

1. Facility management shall perform an event/activity-specific facility management plan for the AHJ to review. (2) The AHJ shall provide guidance as needed, but approval of the AHJ for the specific facility management plan shall occur prior to such event.

2. No further change to advisory annex text A.16.4.1.1 and A.16.4.1.3

Additional Proposed Changes

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<tr>
<th>File Name</th>
<th>Description</th>
<th>Approved</th>
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Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 15-1 (Log 1131) issued by the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitter’s Substantiation: This TIA is submitted at the recommendation of the Correlating Committee on the Building Code which reviewed technical changes being made to the Life Safety Evaluation provisions related to designer and owner responsibilities (NFPA 5000 16.4.1) by the Assembly Occupancies Technical via the Second Draft for the 2015 Annual Meeting. The Correlating Committee is in agreement with the technical committee chair that revision is desirable to avoid potential for incorrect and inconsistent enforcement. The processing of the TIA is intended to provide the Standards Council with the materials it will need to blend the changes from the TIA with the code text developed by the committee for issuance as part of the 2015 edition of NFPA 5000 – something the Council will address at its August 2014 meeting. Substantiation for the proposed corrections follows.

1. NFPA 5000 16.4.1.4.2 Life Safety Narrative. The Second Draft omits the following requirements for the Life Safety Narrative: egress; access control; fire barriers, smoke barriers, and smoke partitions; fire detection; and emergency elevator operation. These features are critical to the overall safety of the occupants. Without specific explanation, designers and enforcers may incorrectly assume that these items were purposefully omitted, which will lead to incomplete, incorrect, and potentially unsafe designs. This TIA corrects these omissions.

2. NFPA 5000 16.4.1.4.4 Engineering Analysis and Calculations. The Second Draft requires smoke control designs to meet NFPA 92 – Standard for Smoke Control Systems, and also requires the design to provide the following: smoke maintained at a level 6 ft above the floor of the means of egress. This new requirement will explicitly prohibit all smoke below 6 ft, whether tenable or not, and whether occupants have evacuated or not. This poses two issues.
Issue A. This is in direct conflict with long standing methods for evaluating performance criteria outlined within NFPA 5000 A.5.2.2. More specifically, this conflicts with Methods 1 and 2.

- Method 1 allows occupants to evacuate through smoke where tenable conditions are maintained.
- Method 2 allows smoke to bank down within areas where occupants are expected to have previously evacuated, such as an upper level balcony in a large open space.

Both Methods allow smoke to descend below 6 ft above the floor of the means of egress, and are considered safe by NFPA 5000.

To be clear, Life Safety Evaluations are intended to follow guidance from NFPA 5000 Chapter 5. The text of A.16.4.1.1 states in part the following.

Life safety evaluations are examples of performance-based approaches to life safety. In this respect, significant guidance in the form and process of life safety evaluations is provided by Chapter 5, keeping in mind the fire safety emphasis in Chapter 5.

The 6 ft requirement is in direct conflict with Chapter 5. This TIA resolves this conflict.

Issue B. The second issue involves practical design implications with the 6 ft requirement, as this puts an undue burden upon designs using Computational Fluid Dynamics (CFD) simulation to substantiate tenability. In many cases, these simulations are necessary and prudent to appropriately account for smoke movement in geometrically complex spaces. In addition, the enhanced detail provided in less complex spaces allows for better informed design.

Consider the following, NFPA 92 Figure A.3.3.13.1 notes that the Smoke Layer Interface is above the First Indication of Smoke. Since equations within NFPA 92 specifically calculate the Smoke Layer Interface, smoke is clearly expected to be present below the NFPA 92 calculated smoke layer. Smoke below the calculated Smoke Layer Interface is neglected for Equations within NFPA 92.

CFD simulations provide better resolution of the smoke layer properties, and predict the Transition Zone with relatively good accuracy. When CFD methods are required to limit all smoke below the 6 ft zone (6 ft above the floor of the means of egress), the simulations must use the First Indication of Smoke as criteria, rather than the Smoke Layer Interface. Thus, these CFD simulations would require more smoke exhaust and would maintain the Smoke Layer Interface at a greater distance above the floor than required by NFPA 92 equations. This TIA resolves this conflict.

3. Example Inconsistencies NFPA 5000 16.4.1.3.3.3. Other changes within the TIA are proposed to avoid inconsistencies within NFPA 101. For example, NFPA 5000 16.4.1.3.3.3 in the proposed draft requires the following.

The AHJ shall determine acceptable persons performing the life safety evaluation in a timely manner to enable the design team and facility management to resolve concerns to the satisfaction of the persons performing the life safety evaluation prior to their submission.

The draft language requires the AHJ to determine the acceptable persons. This infers selection and thus places an undue burden on the AHJ. This also takes selection ability and responsibility away from the owner and designer team. The TIA amends the text from determine to approve to be consistent with other portions of NFPA 101.

Emergency Nature: In accordance with the Regulation Governing the Development of NFPA Standards, clause 5.3(a), the proposed TIA intends to correct an error or an omission that was overlooked during a regular revision process.

The changes for the 2015 draft were meant to clarify the responsibilities and the level of detail for Life Safety Analysis. As stated in the above substantiation, the text proposed by the committee includes incorrect and inconsistent provisions. These changes are necessary: (1) to avoid undue burden on the AHJ; (2) to avoid potentially unsafe designs; and (3) to avoid inherent inconsistencies in the 2015 edition of NFPA 5000.

By processing the TIA at this time, the public review and committee balloting (technical committee and
correlating committee) can be completed in time to provide the Standards Council with the materials it will need to blend the changes from the TIA with the code text developed by the committee for issuance as part of the 2015 edition of NFPA 5000.

Submitter Information Verification

Submitter Full Name: TC ON BLD-AXM
Organization: NFPA 5000 TC on Assembly Occupancies
Street Address:
City:
State:
Zip:
Submittal Date: Thu Mar 19 15:30:27 EDT 2015

Committee Statement

Resolution: The provisions for the Life Safety Evaluation (LSE) were expanded, via TIAs in time for the printing of the 2015 edition of NFPA 5000, as issued by the Standards Council. The technical committee restates its understanding that the LSE text of 2015 edition is to remain in place for the 2018 edition. Further, the BLD-AXM committee is free to further revise the text via First Revisions and such changes will be made to the text of the 2015 edition.
Reference: 16.4.1 and A.16.4.1
TIA 15-1
(SC 14-8-34 / TIA Log #1131)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Revise 16.4.1, from what was done by Second Revision SR-173 (Annual 2014 revision cycle – NFPA 5000 Second Draft), to read as follows:

16.4.1 Life Safety Evaluation.
16.4.1.1* General. Where a life safety evaluation is required by other provisions of this Code, it shall comply with all of the following:
   (1) The life safety evaluation shall be performed by persons acceptable to the AHJ.
   (2) The life safety evaluation shall include a written assessment of safety measures for conditions listed in 16.4.1.2 and of the building systems and facility management in accordance with 16.4.1.3.
   (3) The life safety evaluation shall be approved annually by the AHJ and shall be updated for special or unusual conditions.

16.4.1.2 Conditions to Be Assessed. Life safety evaluations shall include an assessment of all of the following conditions and the related appropriate safety measures:
   (1) Nature of the events and the participants and attendees
   (2) Access and egress movement, including crowd density problems
   (3) Medical emergencies
   (4) Fire hazards
   (5) Permanent and temporary structural systems
   (6) Severe weather conditions
   (7) Earthquakes
   (8) Civil or other disturbances
   (9) Hazardous materials incidents within and near the facility
   (10) Relationships among facility management, event participants, emergency response agencies, and others having a role in the events accommodated in the facility

16.4.1.3* Building Systems and Facility Management Assessments. Life safety evaluations shall include assessments of both building systems and facility management upon which reliance is placed for the safety of facility occupants, and such assessments shall consider scenarios appropriate to the facility.

16.4.1.3.1 Building Systems. Prior to issuance of the building permit, the design team shall provide the AHJ with building systems documentation in accordance with 16.4.1.4.
16.4.1.3.2 Facility Management. Prior to issuance of the certificate of occupancy, the facility management shall provide the AHJ with facility management documentation in accordance with 16.4.1.5.

16.4.1.3.3 Life Safety Evaluation.
16.4.1.3.3.1 Prior to issuance of the building permit, the persons performing the life safety evaluation shall confirm that the building systems provide appropriate safety measures.
16.4.1.3.3.2 Prior to issuance of the certificate of occupancy, the persons performing the life safety evaluation shall confirm that the facility management and operational plans provide appropriate safety measures.
16.4.1.3.3.3 The AHJ shall approve the acceptable persons performing the life safety evaluation in a timely manner to enable the design team and facility management to resolve concerns to the satisfaction of the persons performing the life safety evaluation prior to their submission.

16.4.1.4 Life Safety Building Systems Document. The AHJ shall be provided with a life safety building systems document providing the information required in 16.4.1.4.2 through 16.4.1.4.4.

16.4.1.4.1 Document Distribution. The persons performing the life safety evaluation, the AHJ, the A/E design team, and the building owner shall receive a copy of the life safety building systems document prior to issuance of the building permit.

16.4.1.4.2 Life Safety Narrative. A life safety narrative shall be provided describing the following:
   (1) Building occupancy, construction type, and intended uses and events
   (2) Building area and population capacity of the proposed facility
   (3) Principal fire and life safety features/strategies for the building, including— as applicable—the following:
      (a) Egress
      (b) Access control
      (c) Fire barriers, smoke barriers, and smoke partitions
      (d) Fire suppression systems
      (e) Smoke control/protection
      (f) Fire detection and alarm
      (g) PA system
      (h) Emergency elevator operation
      (i) Emergency power and lighting
      (j) Provisions for patrons with disabilities
      (k) Fire department access
      (l) Fire/Emergency command center
   (4) Exterior construction design parameters used/applied

16.4.1.4.3 Life Safety Floor Plans. Life safety floor plans of each level shall be provided— as applicable— with the following:
   (1) Occupant load, exit location, egress capacity, main entrance/exit, horizontal exits, travel distance, and exit discharge
   (2) Fire barriers, smoke barriers, and smoke partitions
   (3) Areas of smoke-protected assembly occupancy
   (4) Separate smoke-protected areas or zones
   (5) Areas of other occupancy type and separations
   (6) Unprotected vertical openings
   (7) Event plans for each anticipated type of event depicting the following:
      (a) Seating configuration
      (b) Exhibit booth layout
      (c) Stage location
      (d) Occupant load, egress capacity required, exits provided, and travel distance
      (e) Any floor or stage use restrictions
      (f) Plan and/or section drawing indicating areas where the roof construction is more than 50 ft (15 m) above floor level and areas where sprinkler protection is omitted
      (g) Areas of refuge — interior and exterior

16.4.1.4.4 Engineering Analysis and Calculations. An engineering analysis shall be provided with the following:
   (1) Smoke protection analysis to substantiate the use of smoke-protected assembly seating as follows:
      (a) Performance-based design methods approved by the AHJ
      (b) Smoke control requirements per NFPA 92, Standard for Smoke Control Systems
      (c) Smoke control assumptions, such as fire scenario description, fire size quantification, and smoke development/smoke movement analysis
      (d) Proposed testing protocol for smoke control system and pass/fail criteria
      (e) Timed egress analysis and assumed flow rates and travel speeds

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist)
(2) Sprinkler protection calculations, including an engineering analysis substantiating locations in accordance with 16.3.5.3 where sprinkler protection would be ineffective due to height and combustible loading
(3) Load diagram of rigging/load capacity of gridiron, fly loft, or long-span roof structure used for hanging overhead objects

16.4.1.5 Life Safety Management Document. The AHJ shall be provided with a life safety management document providing the information required in 16.4.1.5.2 through 16.4.1.5.7.

16.4.1.5.1 Document Distribution. The persons performing the life safety evaluation, the AHJ, the A/E design team, and the building owner shall receive a copy of the life safety management document prior to issuance of the certificate of occupancy.

16.4.1.5.2 Facility Management and Operational Plans. Facility management and operational plans shall address the following:

(1) Best practices adopted or recognized
(2) Emergency plans
(3) Evacuation plans
(4) Shelter-in-place plans, including capacities and protection considerations
(5) Crowd management training plan
(6) Safety plans, which include the following:
   (a) Training plans
   (b) Safety equipment plans
(7) Fire alarm, smoke control system protocol, and testing plans
(8) First aid or medical treatment plans, which include the following:
   (a) Defined levels of service
   (b) Standing orders adopted
   (c) Supply and equipment plan
(9) Housekeeping plans — biological, medical, hazardous materials cleaning
(10) Emergency communication plans, which include the following:
    (a) Chain of authority and incident command system employed
    (b) Contact information for the following:
       i. Venue personnel
       ii. Emergency management and response organizations, such as fire, police, medical, utility, transportation, and key stakeholders
    (c) Communication systems
    (d) Standard announcement for incidents or emergency situations
(11) Risk and threat assessment for venue and surrounding area for the following:
    (a) Severe weather
    (b) Hazardous materials
    (c) Terrorism
    (d) Hostile intruder
(12) Operating procedures and protocols for risks, such as the following:
    (a) Severe weather preparedness and monitoring plans
    (b) Hazardous materials incidence response plans
    (c) Terrorism response plans
    (d) Hostile intruder response plans
(13) First responder response/arrival routes plans
(14) Alcohol management plans
(15) Food safety plans
(16) Rigging and temporary performance structure, which includes the following:
    (a) Design and safety review plans
    (b) Emergency action plans
(17) Chemical and hazardous materials information and data
(18) Barrier and wall protection plans for motor sports or similar events

16.4.1.5.3 Records. Records of the facility management plans, including procedures and location, shall be maintained for the following:

(1) Crowd management training
(2) Safety training
(3) Fire alarm, smoke control system maintenance, and test records
(4) First aid or medical treatment and regulation compliance
16.4.1.5.4 Building Systems Reference Guide. A building systems reference guide shall be provided in accordance with 16.4.1.5.4.1 through 16.4.1.5.4.3.

16.4.1.5.4.1 A basic life safety building systems reference guide shall be developed and maintained.

16.4.1.5.4.2 The life safety building systems reference guide shall contain the important and key information for the venue management’s use when planning events/activities for the safety of patrons, performers/participants, employees, and vendors.

16.4.1.5.4.3 The life safety building systems document in accordance with 16.4.1.4 shall be permitted to be used, and additionally the life safety building systems reference guide shall include the following:

1. Occupant capacity of every space/room
2. Egress flow diagrams, including assumed flow rates, and capacities of all aisles and hallways, including public and nonpublic areas
3. Capacities of all exterior doors and/or choke points in immediate perimeter areas
4. Limitations or assumptions for ingress control that could be in place during an emergency egress/evacuation, including control gates, queuing barriers, and turnstiles
5. Capacities of immediate perimeter exterior walkways, including assumed flow rates for exterior areas
6. Assumed egress paths for normal conditions — transportation modes
7. Management level sequencing charts for alarm and emergency communication systems, the manual, or override options/instructions that include the following:
   a. List of codes or alarm signals
   b. Location of manual overrides
   c. Description of sequence of operations during an alarm such as exhaust fans operate or doors open
8. Principal fire and life safety features/strategies, such as sprinklers, smoke control, fire alarm notifications, PA system, emergency power, and fire department access
9. Assumptions when developing occupancy plans for venue floor, open areas, and nonevent spaces, such as the following:
   a. Event floor plans/setup diagrams for each typical event/activity
   b. Fire sprinkler and smoke protection capabilities
10. Severe weather shelter areas, locations, structure considerations (limitations), capacities (occupancy and density factor)
11. Command center, which includes the following:
   a. Location (formal or informal)
   b. Structural integrity considerations
   c. Redundant locations and/or capabilities
   d. Jurisdictional rights — assumed and/or applied
12. Locations and capacities of wheelchair and mobility-impaired seating
13. Locations and capacities of areas of refuge and other safe areas
14. Rigging or structural load capacities of grids, truss structure, fly lofts, ceilings, floors, ramps, and staging
15. List of locations of emergency equipment such as fire extinguishers, fire hose cabinets, fire hydrants, AEDs
16. Sequencing of electrical service, such as the following:
   a. Emergency generators and charts of all areas illuminated during power outages
   b. Multiple electrical feed capabilities
17. List of mechanical, moveable equipment in the facility
18. Potential hazards in the surrounding neighborhood, including train tracks and propane stations
19. Assumptions or accommodations considered and used in design

16.4.1.5.5 The facility management plans shall be maintained and adjusted as necessary for changes to the venue structure, operating purposes and style, and event occupancy.

16.4.1.5.6 Facility management and operational plans shall be submitted to the AHJ annually.

16.4.1.5.7 For events and activities at the venue that are outside the normal operating conditions or vary from the normal facility management plans, the following shall apply:

1. Facility management shall perform an event/activity-specific facility management plan for the AHJ to review.
2. Approval of the AHJ for the specific facility management plan shall occur prior to such event.

2. No further change to advisory annex text A.16.4.1.1 and A.16.4.1.3
1. Delete 32.3.7 as follows:

32.3.7 In addition to the other requirements of Section 32.3, tents used for the retail sales of consumer fireworks, 1.4G, shall comply with NFPA1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.

Additional Proposed Changes

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<th>Description</th>
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Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 15-3 (Log No. 1140) issued by the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitter’s Substantiation: Deletes reference to NFPA 1124, or a consumer fireworks provision, or both. Consistent with NFPA Standards Council Decision D#14-1, issued March 3, 2014, NFPA has temporarily withdrawn NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles. The effect of this decision is that no recognized criteria for the subjects previously governed by NFPA 1124 exist within the NFPA codes and standards system; thus, this TIA works to align NFPA 5000 with that circumstance.

Emergency Nature: NFPA 1124 has been temporarily withdrawn as a result of Standards Council Decision D#14-1, which was issued March 3, 2014, subsequent to completion of the NFPA 5000-2015 Second Draft, but prior to the issuance of NFPA 5000-2015. Accordingly, this TIA is intended to be issued concurrently with NFPA 5000-2015.

Submitter Information Verification

Submitter Full Name: TC ON BLD-SCM
Organization: NFPA 5000 TC on Structures, Construction and Materials
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 20 09:23:51 EDT 2015

Committee Statement

Resolution: FR-7501-NFPA 5000-2015
Statement: NOTE: This public input originates from Tentative Interim Amendment No. 15-3 (Log No. 1140) issued by the Standards Council on August 14, 2014 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Submitters Substantiation: Deletes reference to NFPA 1124, or a consumer fireworks provision, or both. Consistent with NFPA Standards Council Decision D#14-1, issued March 3, 2014, NFPA has temporarily withdrawn NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles. The effect of this decision is that no recognized criteria for the subjects previously governed by NFPA 1124 exist within the NFPA codes and standards system; thus, this TIA works to align NFPA 5000 with that circumstance.

This FR removes reference to NFPA 1124 from the 2018 edition.
Reference: 32.3.7
TIA 15-3
(SC 14-8-36 / TIA Log #1140)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Delete 32.3.7 as follows:

32.3.7 In addition to the other requirements of Section 32.3, tents used for the retail sales of consumer fireworks, 1.4G, shall comply with NFPA1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.

Issue Date: August 14, 2014
Effective Date: September 3, 2014

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist)
Throughout standard remove references to the following and replace with the following:

1. ACI 216.1/TMS 0216.1 and replace with ACI 216.1.
2. ANSI/UL and replace with UL.
4. ASHRAE # and replace with ASHRAE STD #.
8. FM # and replace with FM Approval #.
10. FM 4435 Approval Standard for Roof Perimeter Flashing and replace FM Approval 4435, Edge Systems Used With Low Slope Roofing Systems.
14. ACI 530/ASCE 5/TMS 402 and replace with ACI 530/530.1.
15. American Society of Mechanical Engineers and replace with ASME International.
17. C4 and so on under American Wood Protection Association and replace with AWPA C4 and so on.
Design of Slabs-on-Ground Foundations and replace with TF 700-R Design of Slabs-on-Ground.

Statement of Problem and Substantiation for Public Input

The recommended revisions correlate with PI-1 and PI-3.

Related Public Inputs for This Document

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<td>Referenced current SDO names, addresses, standard names, numbers, and editions.</td>
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Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [ Not Specified ]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Feb 13 17:20:40 EST 2015

Committee Statement

Resolution: Multiple First Revisions address the submitter's items.
Change “mall” to “mall concourse” throughout the document.

Statement of Problem and Substantiation for Public Input

Statement: The term “mall” is often misused when applying the current Code provisions. The term “mall concourse” is a term more commonly used in the field and clarifies the application of the provisions for mall structures. Several proposed changes related to the provisions for mall structures have been submitted this cycle. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 15:03:47 EDT 2015

Committee Statement

Resolution: FR-6508-NFPA 5000-2015
Statement: Statement: The term "mall" is often misused when applying the current Code provisions. The term "mall concourse" is a term more commonly used in the field and clarifies the application of the provisions for mall structures. Several proposed changes related to the provisions for mall structures have been submitted this cycle. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall structures.
Public Input No. 99-NFPA 5000-2015 [ Global Input ]

Change “mall building” to “mall structure” throughout the document.

Statement of Problem and Substantiation for Public Input

Statement: The provisions of 27.4.4 may apply to facilities with multiple buildings with an open mall concourse as a single structure. The term “mall structure” encompasses the multiple types of mall facilities that can apply the provisions of this section. Additional revisions are being proposed to Section 36/37.4.4 to support this concept. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Thu Jul 02 15:05:10 EDT 2015

Committee Statement

Resolution: FR-6509-NFPA 5000-2015
Statement: The provisions of 27.4.4 may apply to facilities with multiple buildings with an open mall concourse as a single structure. The term “mall structure” encompasses the multiple types of mall facilities that can apply the provisions of this section. Additional revisions are being proposed to Section 27.4.4 to support this concept. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall structures.
1.3.1 Buildings and Structures.

The other than buildings used for the retail sales and associated storage of consumer fireworks, the provisions of the Code shall apply to the construction, alteration, repair, equipment, use and occupancy, maintenance, relocation, and demolition of every building or structure, or any appurtenances connected or attached to such buildings or structures within the jurisdiction.

Statement of Problem and Substantiation for Public Input

Standards Council Decision #14-1 directed the NFPA Technical Committees to discontinue requirements for the storage and retail sales of consumer fireworks. The Council then directed and subsequently issued a series of TIA's removing any requirements for consumer fireworks from NFPA codes and standards. Unfortunately the TIA's did not accomplish the intent of the Council Decision; but rather, created an unacceptable situation in which consumer fireworks are currently treated as ordinary hazard contents by the various NFPA codes and standards. Instead of not addressing the retail sales of consumer fireworks, NFPA 5000 now treats such facilities as a mercantile occupancy with ordinary hazard contents. In order to accomplish the directive issued by the Council, the storage and retail sales of consumer fireworks needs to be specifically excluded from the scope of NFPA 5000. While the APA continues to believe that the Council Decision was based on false and misleading information and that the resulting action is contrary to NFPA's mission of "eliminating death, injury, property and economic loss due to fire, electrical and related hazards", the APA submits the Public Input to correct the errors made in implementing the Council Decision.

Related Public Inputs for This Document

Related Input Relationship
Public Input No. 171-NFPA 5000-2015 [New Section after A.1.2]

Submitter Information Verification

Submitter Full Name: WILLIAM KOFFEL
Organization: KOFFEL ASSOCIATES INC
Affiliation: American Pyrotechnics Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 07:54:02 EDT 2015

Committee Statement
Resolution: The wording/formatting of this provision in NFPA 5000 is different from that of NFPA 101 where the TC created a FR to make a similar change requested by the submitter. In NFPA 5000, the change would have the effect of exempting from Code requirements the ENTIRE building in which retail sales and associated storage of consumer fireworks occur; such change has not been technically substantiated and appears not to be what the submitter intends.
1.7.5.2.2 Existing Installations.

Buildings in existence at the time of the adoption of this Code shall be permitted to have their existing use or occupancy continued if such use or occupancy was legal at the time of the adoption of this Code, provided that such continued use is not deemed an unsafe building or fire hazard.

Statement of Problem and Substantiation for Public Input

The term “not dangerous to life” is subjective. Section 1.7.5.3.1.1 describes Unsafe Buildings. And Section 1.7.5.3.1.2 describes Fire Hazards. The two descriptions are comprehensive and if will provide consistent enforcement.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)

Committee Statement

Resolution: FR-6037-NFPA 5000-2015
Statement: The term “not dangerous to life” is subjective. Section 1.7.5.3.1.1 describes Unsafe Buildings. And Section 1.7.5.3.1.2 describes Fire Hazards. The two descriptions are comprehensive and the word changes will facilitate consistent enforcement.
Deferred submittal of construction documents shall be approved by the authority having jurisdiction prior to the issuance of a building permit. The RDP for design shall identify all deferred submittals in writing with the application for permit. Construction documents for deferred submittal items shall be reviewed by the RDP for design for general conformance to the RDP's design, and then submitted to the authority having jurisdiction. Deferred submittal items shall not be installed until their performance requirements and construction documents have been approved by the authority having jurisdiction.

Statement of Problem and Substantiation for Public Input

Currently there is no requirement for evidence that the RDP has in fact reviewed the deferred submittal. This change requires written endorsement from the RDP that the deferred submittals are in conformance with their design.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 16:46:12 EDT 2015

Committee Statement

Resolution: The Code cannot make someone responsible for someone else's design. No justification was provided for requiring a letter.
2.2 NFPA Publications.
National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.


Statement of Problem and Substantiation for Public Input

If PI 172, which adds a requirement to perform testing of integrated systems is accepted, there should be a reference to NFPA 4 in Chapter 2.

Related Public Inputs for This Document

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<td><a href="http://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentPara">http://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentPara</a>...</td>
</tr>
</tbody>
</table>
Public Input No. 172-NFPA 5000-2015 [Section No. 55.1.4] Adds reference if PI 172 is accepted.

Submitter Information Verification

Submitter Full Name: THOMAS HAMMERBERG
Organization: AUTOMATIC FIRE ALARM ASSOCIATION
Affiliation: AUTOMATIC FIRE ALARM ASSOCIATION
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 08:53:50 EDT 2015

Committee Statement

Resolution: FR-6038-NFPA 5000-2015
Statement: The FR adds NFPA 4, NFPA xx as requirements are being added within the Code for mandatory use of the documents.
2.2 NFPA Publications.


Statement of Problem and Substantiation for Public Input

The requirements within the IAPMO Uniform Mechanical Code which is adopted as a mandatory referenced standard in Section 2.2.23 compressively govern all aspects of building ventilation for new buildings and systems. As such there is no need to adopt NFPA 90A and NFPA 90B which only address limited features of those same systems. Relying solely on the IAPMO Mechanical Code, will provide a single source and eliminate overlapping requirements that differ slightly or contradict each other.

Submitter Information Verification
Committee Statement

Resolution: Section 2.2 must accurately reflect all NFPA documents that are referenced in a mandatory way in Chapter 1 through 55 of the Code. As long as NFPA 90A and NFPA 90B are referenced elsewhere, they must be retained in Section 2.2.
2.3 Other Publications.

2.3.1 AA Publications.

2.3.2 ACI Publications.
American Concrete Institute, P.O. Box 9094 38800 Country Club Drive, Farmington Hills, MI 48333-9094 3434.

2.3.3 AISC Publications.
American Institute of Steel Construction, One East Wacker Drive, Suite 3400, 700, Chicago, IL 60601-2001 1802.
2.3.4  AISI Publications.
American Iron and Steel Institute, 25 Massachusetts Avenue N.W., Suite 800, Washington, DC 20001-1431.


AISI-S110, Standard for Seismic Design of Cold-Formed Steel Structural Systems—Special Bolted Moment Frames, 2007, including Supplement 1, dated 2009, (Reaffirmed 2012).


AISI-S220, North American Standard for Cold-Formed Steel Framing — Nonstructural Members, 2011.


2.3.5  AITC Publications.
American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Centennial, CO 80112.


2.3.6  ANSI Publications.
American National Standards Institute, Inc., 25 West 43rd Street, 4th floor, New York, NY 10036.


ANSI A1264.1, Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems, 2007.

2.3.7 ASCE Publications.
American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.
ASCE/SEI 8, *Standard Specification for the Design of Cold-Formed Stainless Steel Structural
ASCE/SEI 17, *Air Supported Structures*, 1996. (Out of Print, No Longer Available)
**ASCE 41, Seismic Evaluation And Retrofit Of Existing Buildings, 2013. (Supersedes
FEMA 356)**

2.3.8 ASHRAE Publications.
American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie
Circle, NE, Atlanta, GA 30329-2305.
Errata, 2015.
ASHRAE STD 62.1, *Ventilation for Acceptable Indoor Air Quality*, 2010 with addenda a, c, d, and e.
2010, 2013, Errata, 2014. (Supersedes ANSI/ IES/ ASHRAE 90.1)
including approved addendum b.
(This is a combined standard)

2.3.9 ASME Publications.
American Society of Mechanical Engineers ASME International, Two Park Avenue, New York,
NY 10016-5990.
ASME A17.7/CSA B 44.7, *Performance-Based Safety Code for Elevators and Escalators*,

2.3.10 ASSE Publications.
American Society of Safety Engineers, 1800 East Oakton Street, Des Plaines, IL 60018, 520 N.
Northwest Highway, Park Ridge, IL 60068.
ANSI/ASSE A1264.1, *Safety Requirements for Workplace Walking/Working Surfaces and Their
Access; Workplace Floor, Wall and Roof Openings; Stairs and Guardrails Systems*, 2007.
2.3.11 ASTM Publications.


ASTM C 954 C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness, 2010, 2011.

ASTM C 955 C955, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases, 2009a, 2011c.


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2013.


|-------------------|----------------------------------------------------------------------------------------------------------------------------------|
2.3.12  AWC Publications.
American Wood Council, 222 Catoctin Circle SE #201, Leesburg, VA 20175.
AWC Wood Construction Data No. 4, Plank and Beam Framing for Residential Buildings, 2003.
2.3.13 AWPA Publications.

American Wood Preservers Protection Association, P.O. Box 388, 361784, Selma Birmingham, AL 36702 35236-0388 1784.

C1, Standard for Preservative Treatment of All Timber Products by Pressure Processes, 2003. (Withdrawn standard)


AWPA C31, Lumber Used Out of Contact with the Ground and Continuously Protected from Liquid Water—Treatment by Pressure Processes, 2002.


AWPA M4, Standard for the Care of Preservative-Treated Wood Products, 2006, 2011.


2.3.14 BHMA Publications.

Builders Hardware Manufacturers Association, 355 Lexington Avenue, 17th, 15th floor, New York, NY 10017-6603.


2.3.15 CGSB Publications.

Canadian General Standards Board, CGSB Sales Centre, Place du Portage III, 6B1, 11 Laurier St., Gatineau, PQ, Quebec, K1A 1G6 Canada.


2.3.16 Composite Panel Association Publications.

Composite Panel Association, Composite Wood Council, 18922 Premiere Court, Gaithersburg, MD 20879-1574, 19465 Deerfield Avenue, Suite 306, Leesburg, VA 20176.


2.3.17 DASMA Publications.

Door and Access Systems Manufacturers Association, International, 1300 Summer Avenue, Cleveland, OH 44115-2851.


2.3.18 EIMA Publications.

EIFS Industry Members Association, 3000 Corporate Center Drive, 513 Broad Street, Suite 270, Morrow, GA 30260, Falls Church, VA 22046-3257.


2.3.19 FM Global Publications.

FM Global, 270 Central Avenue, P.O. Box 7500, Johnston, RI 02919-4923.

FM 4441, Approval 4411, Insulated Wall Constructions, 1974.


FM Approval 4450, Class I Insulated Steel Deck Roofs, 1989.


2.3.20  FRSA/RTI Publications.
Florida Roofing, Sheet Metal and Air Conditioning Contractors Association, 4111 Metric Drive, Suite 6, Winter Park, FL 32792.

2.3.21  GA Publications.
Gypsum Association, 810 First Street, NE, #510, Washington, DC 20002. 6525 Belcrest Road, Suite 480, Hyattsville, MD 20782.

2.3.22  HPVA Publications.
Hardwood Plywood and Veneer Association, P.O. Box 2789, 1825 Michael Faraday Drive, Reston, VA 20195.

2.3.23  IAPMO Publications.
International Association of Plumbing and Mechanical Officials, 20001 Walnut Drive South, Walnut 4755 E. Philadelphia Street, Ontario, CA 91761.

2.3.24  ICC Publications.
International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001-2070.
ICC 600, Standard for Residential Construction in High Wind Regions, 2013

2.3.25  IME Publications.
Institute of Makers of Explosives, 1120 19th Street, NW, Suite 310, Washington, DC 20036–3605.

2.3.26  NAAMM Publications.
National Association of Architectural Metal Manufacturers, 8 South Michigan Avenue, 800 Roosevelt Rd. Bldg. C, Suite 4000 312, Chicago Glen Ellyn, IL 60603 60137.

2.3.27  NCMA Publications.
National Concrete Masonry Association, 13750 Sunrise Valley Drive, Herndon, VA 20171.

2.3.28  PCA Publications.
Portland Cement Association, 5420 Old Orchard Road, Skokie, IL 60077-1083.
2.3.36 TIA Publications.


2.3.37 TPI Publications.

Truss Plate Institute, Inc., 583 D'Onofrio Drive 218 North Lee St. Suite 200 312, Madison Alexandria, WI 53719 VA 22314.

2.3.38 UL Publications.
Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

### Statement of Problem and Substantiation for Public Input

Referenced current SDO names, addresses, standard names, numbers, and editions.

### Related Public Inputs for This Document

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### Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Committee Statement

Resolution: See the multiple First Revisions that revise the Chapter 2 referenced publications entries.
2.3.3 AISC Publications.

Statement of Problem and Substantiation for Public Input

This proposal updates the editions of both AISC 341 and AISC 360. Both documents are currently under development and will be technically complete by the end of 2015.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Affiliation: AISC
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 12:22:32 EDT 2015

Committee Statement

Resolution: FR-6039-NFPA 5000-2015
Statement: This FR updates the editions of both AISC 341 and AISC 360. Both documents are currently under development and will be technically complete by the end of 2015.
Statement of Problem and Substantiation for Public Input

This proposal updates several of the AISI standards currently adopted in NFPA 5000, including AISI S100, AISI S220 and AISI S230. Additionally, references to two new standards are added -- AISI S240 and AISI S400.

With a publication date of 2016, updates to AISI S100 are still being processed.

The newly revised edition of AISI S220 adds performance and testing requirements for screw penetration, update referenced documents, and reference the new AISI S915, Test Standard for Through-the-Web Punchout Cold-Formed Steel Wall Stud Bridging Connectors, and AISI S916, Test Standard for Cold-Formed Steel Framing - Nonstructural Interior Partitions with Gypsum Board.

The newly revised AISI S230 is now in full compliance with the 2015 edition of the International Residential Code, ASCE 7-10 including applicable supplements, and the latest referenced documents. Provisions were added for larger openings in floors, ceilings and roofs. Additionally, the tables were streamlined to reduce complexity and volume of the provisions.
New for the 2018 NFPA 5000, the AISI Committee on Framing Standards has developed AISI S240, North American Standard for Cold-Formed Steel Structural Framing, to address requirements for construction with cold-formed steel structural framing that are common to prescriptive and engineered design. This standard is intended for adoption and use in the United States, Canada and Mexico and integrates the following AISI standards into one document:

* AISI S200-12, North American Standard for Cold-Formed Steel Framing-General Provisions
* AISI S210-07 (2012), North American Standard for Cold-Formed Steel Framing–Floor and Roof System Design (Reaffirmed 2012)
* AISI S211-07(2012), North American Standard for Cold-Formed Steel Framing–Wall Stud Design (Reaffirmed 2012)
* AISI S212-07(2012), North American Standard for Cold-Formed Steel Framing–Header Design (Reaffirmed 2012)
* AISI S213-07w/S1-09(2012), North American Standard for Cold-Formed Steel Framing– Lateral Design with Supplement 1 (Reaffirmed 2012)
* AISI S214-12, North American Standard for Cold-Formed Steel Framing–Truss Design

Consequently, AISI S240 will supersede all previous editions of the above mentioned individual AISI standards.

In 2015, AISI S400, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, was developed. This Standard is intended to address the design and construction of cold-formed steel structural members and connections used in the seismic force-resisting systems in buildings and other structures. In this first edition, the material represents a merging of AISI S110, Standard for Seismic Design of Cold- Formed Steel Structural Systems – Special Bolted Moment Frame, 2007 with Supplement No. 1-09, and the seismic portions of AISI S213, North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 with Supplement No. 1-09. In addition, many of the seismic design requirements stipulated in this Standard are drawn from ANSI/AISC 341-10, Seismic Provisions for Structural Steel Buildings, developed by the American Institute of Steel Construction (AISC). The application of this Standard should be in conjunction with AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members, and AISI S240, North American Standard for Cold-Formed Steel Framing.

Public review on AISI S230, AISI S240 and AISI S400 finishes on July 6, 2015, while the public review on AISI S220 finishes on July 13, 2015; these documents are expected to be published by the end of 2015, with publication of AISI S100 to follow in 2016.

**Related Public Inputs for This Document**

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**Submitter Information Verification**

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Street Address: 
City: 

Page 76 of 863
Committee Statement

Resolution: FR-6040-NFPA 5000-2015

Statement: This FR updates several of the AISI standards currently adopted in NFPA 5000, including AISI S100, AISI S220 and AISI S230. Additionally, references to two new standards are added -- AISI S240 and AISI S400 as they are being referenced elsewhere in the Code as mandatory references.

With a publication date of 2016, updates to AISI S100 are still being processed.

The newly revised edition of AISI S220 adds performance and testing requirements for screw penetration, update referenced documents, and reference the new AISI S915, Test Standard for Through-the-Web Punchout Cold-Formed Steel Wall Stud Bridging Connectors, and AISI S916, Test Standard for Cold-Formed Steel Framing - Nonstructural Interior Partitions with Gypsum Board.

The newly revised AISI S230 is now in full compliance with the 2015 edition of the International Residential Code, ASCE 7-10 including applicable supplements, and the latest referenced documents. Provisions were added for larger openings in floors, ceilings and roofs. Additionally, the tables were streamlined to reduce complexity and volume of the provisions.

New for the 2018 NFPA 5000, the AISI Committee on Framing Standards has developed AISI S240, North American Standard for Cold-Formed Steel Structural Framing, to address requirements for construction with cold-formed steel structural framing that are common to prescriptive and engineered design. This standard is intended for adoption and use in the United States, Canada and Mexico and integrates the following AISI standards into one document:

* AISI S200-12, North American Standard for Cold-Formed Steel Framing-General Provisions

* AISI S210-07 (2012), North American Standard for Cold-Formed Steel Framing–Floor and Roof System Design (Reaffirmed 2012)

* AISI S211-07(2012), North American Standard for Cold-Formed Steel Framing–Wall Stud Design (Reaffirmed 2012)

* AISI S212-07(2012), North American Standard for Cold-Formed Steel Framing–Header Design (Reaffirmed 2012)

* AISI S213-07w/S1-09(2012), North American Standard for Cold-Formed Steel Framing– Lateral Design with Supplement 1 (Reaffirmed 2012)

* AISI S214-12, North American Standard for Cold-Formed Steel Framing–Truss Design

Consequently, AISI S240 will supersede all previous editions of the above mentioned individual AISI standards.

In 2015, AISI S400, North American Standard for Seismic Design of Cold-Formed Steel...
Structural Systems, was developed. This Standard is intended to address the design and construction of cold-formed steel structural members and connections used in the seismic force-resisting systems in buildings and other structures. In this first edition, the material represents a merging of AISI S110, Standard for Seismic Design of Cold-Formed Steel Structural Systems – Special Bolted Moment Frame, 2007 with Supplement No. 1-09, and the seismic portions of AISI S213, North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 with Supplement No. 1-09. In addition, many of the seismic design requirements stipulated in this Standard are drawn from ANSI/AISC 341-10, Seismic Provisions for Structural Steel Buildings, developed by the American Institute of Steel Construction (AISC). The application of this Standard should be in conjunction with AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members, and AISI S240, North American Standard for Cold-Formed Steel Framing.

Public review on AISI S230, AISI S240 and AISI S400 finishes on July 6, 2015, while the public review on AISI S220 finishes on July 13, 2015; these documents are expected to be published by the end of 2015, with publication of AISI S100 to follow in 2016.
2.3.5 AITC Publications.
American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Centennial, CO 80112.

Add new reference standard in Chapter 2:
Rehabilitation Engineering and Assistive Technology Society of North America (RESNA), 1700 North Moore Street, Suite 1540, Arlington, VA 22209
ANSI/RESNA ED-1 Evacuation Devices Volume 1: Emergency Stair Travel Devices for Individuals with Disabilities - 2013

Statement of Problem and Substantiation for Public Input

Emergency stair travel devices are now covered by a performance standard (ANSI/RESNA ED-1:2013), and the availability of these devices will greatly increase safety of individuals with disabilities during evacuations.

Submitter Information Verification

Submitter Full Name: GLENN HEDMAN
Organization: UNIV OF ILLINOIS AT CHICAGO
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 11:34:14 EDT 2015

Committee Statement

Resolution: No FR was created to add a requirement for mandatory use of the RESNA document, so it can not be placed in Chapter 2 The RESNA document will continue to be referenced in current Annex H Informational References as it appears in advisory Annex A.
2.3.7 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.


Statement of Problem and Substantiation for Public Input

This proposal is intended to function as a placeholder for the update of ASCE standards. The newest version of ASCE 24 (2014) is now available and references to the new edition should be checked throughout NFPA 5000. Updates to ASCE 7, 8 (possibly), 19, 29, 41 and 55 are anticipated within the next two years. Please note that the adoption of ASCE 7 will require additional modifications to several chapters in NFPA 5000, including Chapter 3 (Definitions), Chapter 5 (Performance Based Design), Chapter 35 (Structural Design), etc. Also note that ASCE 17 is being merged into the new ASCE 55, Tension Membrane Structures, and ASCE 31 was merged into the 2013 edition of ASCE 41. There is a 2017 edition of ASCE 41 expected and, as such, that has been recommended for adoption.

Related Public Inputs for This Document

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### Resolution: FR-6041-NFPA 5000-2015

**Statement:** This FR is intended to function as a placeholder for the update of ASCE standards. The newest version of ASCE 24 (2014) is now available and references to the new edition should be checked throughout NFPA 5000. Updates to ASCE 7, 8 (possibly), 19, 29, 41 and 55 are anticipated within the next two years. Please note that the adoption of ASCE 7 will require additional modifications to several chapters in NFPA 5000, including Chapter 3 (Definitions), Chapter 5 (Performance Based Design), Chapter 35 (Structural Design), etc. Also note that ASCE 17 is being merged into the new ASCE 55, Tension Membrane Structures, and ASCE 31 was merged into the 2013 edition of ASCE 41. There is a 2017 edition of ASCE 41 expected and, as such, that has been recommended for adoption.
2.3.7 ASCE Publications.
American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

Statement of Problem and Substantiation for Public Input

The ASCE/SEI standard Flood Resistant Design and Construction was revised in 2014. This proposed change updates the date. Companion proposals update section where NFPA 5000 specifically references sections in ASCE 24.

Related Public Inputs for This Document

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Submitter Information Verification

<table>
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<tr>
<th>Submitter Full Name:</th>
<th>Rebecca Quinn</th>
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<td>RCQuinn Consulting, Inc.</td>
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Committee Statement
Resolution: FR-6041-NFPA 5000-2015

Statement: This FR is intended to function as a placeholder for the update of ASCE standards. The newest version of ASCE 24 (2014) is now available and references to the new edition should be checked throughout NFPA 5000. Updates to ASCE 7, 8 (possibly), 19, 29, 41 and 55 are anticipated within the next two years. Please note that the adoption of ASCE 7 will require additional modifications to several chapters in NFPA 5000, including Chapter 3 (Definitions), Chapter 5 (Performance Based Design), Chapter 35 (Structural Design), etc. Also note that ASCE 17 is being merged into the new ASCE 55, Tension Membrane Structures, and ASCE 31 was merged into the 2013 edition of ASCE 41. There is a 2017 edition of ASCE 41 expected and, as such, that has been recommended for adoption.
2.3.11 ASTM Publications.


ASTM C 954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness, 2010.

ASTM C 955, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases, 2009a.


ASTM D 3462/D 3462 M, Standard Specification for Asphalt Shingles Made from Glass Felt and
Surfaced with Mineral Granules, 2010a.


ASTM E 2404, Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (including Vinyl) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate to Assess Surface Burning Characteristics, 2013.


ASTM E 2768, Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials, year?


Statement of Problem and Substantiation for Public Input

Added reference standard.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: JOHN WOESTMAN
Organization: KELLEN
Affiliation: Composite Lumber Manufacturers Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 16:31:58 EDT 2015

Committee Statement

Resolution: FR-6042-NFPA 5000-2015
Statement: Edition date updating. Also added ASTM D7032, ASTM E2072 and ASTM E2073 as they are referenced elsewhere in the Code.
2.3.11 ASTM Publications.


ASTM C 954 C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness, 2010.

ASTM C 955 C955, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases, 2009a.


ASTM E 2404 E2404, Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (including Vinyl) and Wood Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate to Assess Surface Burning Characteristics, 2013 2015.

ASTM E 2573 E2573, Standard Practice for Specimen Preparation and Mounting of


Statement of Problem and Substantiation for Public Input

date updates

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jun 04 12:53:27 EDT 2015

Committee Statement

Resolution: FR-6042-NFPA 5000-2015
Statement: Edition date updating. Also added ASTM D7032, ASTM E2072 and ASTM E2073 as they are referenced elsewhere in the Code.
2.3.31 SDI Publications.
Steel Deck Institute, PO Box 25, Fox River Grove, IL 60021 P. O. Box 426, Glenshaw, PA 15116.

Statement of Problem and Substantiation for Public Input

This proposal adopts the new editions of the SDI documents. Additionally, while the reference to SDI-QA/QC was added in Section 40.3.10(3) for the 2015 edition of NFPA 5000, it was not picked up here. (Note that this should be an errata for the 2015 edition.) Finally, there is a new address for SDI.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 13:45:58 EDT 2015

Committee Statement

Resolution: FR-6043-NFPA 5000-2015
Statement: This proposal adopts the new editions of the SDI documents. Additionally, while the reference to SDI-QA/QC was added in Section 40.3.10(3) for the 2015 edition of NFPA 5000, it was not picked up here. Also, there is a new address for SDI.
2.3.31 SDI Publications.
Steel Deck Institute, PO Box 25426, Fox River Grove, IL 60021, Glenshaw, PA, 15116

Statement of Problem and Substantiation for Public Input

1. The address of the Steel Deck Institute is updated.
2. The QA/QC Standard is included as a reference standard in the 2015 NFPA 5000, but was not included in the reference document list in Chapter 2. The version for the 2015 Code was the 2011 version of the standard. This is an editorial correction/addition.
3. All 4 standards are updated to the 2017 editions, which will be available prior to the final approval of the 2018 NFPA 5000.

Submitter Information Verification

Submitter Full Name: Thomas Sputo
Organization: Steel Deck Institute
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 26 14:52:27 EDT 2015

Committee Statement

Resolution: FR-6043-NFPA 5000-2015
Statement: This proposal adopts the new editions of the SDI documents. Additionally, while the reference to SDI-QA/QC was added in Section 40.3.10(3) for the 2015 edition of NFPA 5000, it was not picked up here. Also, there is a new address for SDI.
Statement of Problem and Substantiation for Public Input

The 2015 edition (44th Edition) of the combined SJI-100, Standard Specification for K-Series, LH-Series and DLH-Series Open Web Steel Joists and for Joist Girders, represents a major change in the presentation of the SJI specifications. Previously there were three separate specifications (all found in the 43rd Edition), covering K-Series, LH/DLH-Series and Joist Girders, each one an ANSI standard. The newly completed combined standard represents a major simplification for the specifying professional.

Additionally, SJI-CJ will be updated by the end of 2015.

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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY  
Organization: AMERICAN IRON AND STEEL INSTIT  
Affiliation: SJI  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Jul 06 14:00:50 EDT 2015

Committee Statement

were three separate specifications (all found in the 43rd Edition), covering K-Series, LH/DLH-Series and Joist Girders, each one an ANSI standard. The newly completed combined standard represents a major simplification for the specifying professional.

Additionally, SJI-CJ will be updated by the end of 2015.
2.3.38 UL Publications.
Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.
The proposed changes reflect updated editions of UL Standards

Submitter Information Verification

Submitter Full Name: RONALD FARR
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 09:01:04 EDT 2015

Committee Statement

Resolution: FR-6045-NFPA 5000-2015
Statement: The changes reflect updated editions of UL Standards.
Public Input No. 207-NFPA 5000-2015 [ New Section after 3.3 ]

Add new definition:

**Steel Storage Racks.** A framework or assemblage, comprised of cold-formed or hot-rolled steel structural members, intended for storage of materials, including, but not limited to, pallet storage racks, selective racks, movable-shelf racks, rack-supported systems, automated storage and retrieval systems (stacker racks), push-back racks, pallet-flow racks, case-flow racks, pick modules and rack-supported platforms. Other types of racks, such as drive-in or drive-through racks, cantilever racks, portable racks or racks made of materials other than steel, are not considered steel storage racks for the purpose of this standard.

Statement of Problem and Substantiation for Public Input

There is merit in adding a definition for steel storage racks for clarification of the requirements in Section 44.6. This definition has been recommended for inclusion in ASCE 7-16, which will be adopted in the 2018 edition of NFPA 5000.

Related Public Inputs for This Document

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Submitter Information Verification

**Submitter Full Name:** BONNIE MANLEY

**Organization:** AMERICAN IRON AND STEEL INSTIT

**Affiliation:** RMI

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Jul 06 14:12:23 EDT 2015

Committee Statement

**Resolution:** FR-7502-NFPA 5000-2015. The other requirements suggested in the PI were relocated to Chapter 44 in FR 7517 and 7519.

**Statement:** There is merit in adding a definition for steel storage racks for clarification of the requirements in Section 44.6. This definition has been recommended for inclusion in ASCE 7-16, which will be adopted in the 2018 edition of NFPA 5000.
3.3.220.4 Interior Wall Finish.
The interior finish of columns, fixed or movable walls, and fixed or movable partitions.

(annex section A.3.3.22.4 is proposed, to read as follows: Such partitions are intended to include washroom water closet partitions)

Statement of Problem and Substantiation for Public Input

The annex note to A.10.1.3 belongs to A.3.3.220.4.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 22 21:28:26 EDT 2015

Committee Statement

Resolution: FR-5501-NFPA 5000-2015
Statement: This annex note is currently associated with A.10.1.3 but it belongs here to provide additional clarification on the application of interior wall finish.
Public Input No. 37-NFPA 5000-2015 [ Section No. 3.3.683.1 ]

3.3.683.1 Fire Retardant–Treated Wood.
   A wood product impregnated with chemical by a pressure process or impregnated with chemical by other means during manufacture, treated to exhibit reduced surface-burning characteristics and resist propagation of fire. [703, 2015] (BLD-SCM)

Statement of Problem and Substantiation for Public Input

Discussion during past code development cycles have shown there is confusion as to what process the phrase "other means during manufacture" is referring. Testimony often leaves out the "during manufacture" part of the phrase leading one to assume coating applied after manufacture is permitted. Attempts to clarify have only been partially successful.

Dictionary Definition: impregnate
im-preg-nate (im-pregnat)v.tr. im-preg-nat-ed, im-preg-nat-ing, im-preg-nates. 1. To make pregnant; inseminate. 2. To fertilize (an ovum, for example). 3. To fill throughout; saturate: a cotton wad that was impregnated with ether. 4. To permeate or imbue: impregnate a speech with optimism. Excerpted from American Heritage Talking Dictionary. Copyright © 1997 The Learning Company, Inc. All Rights Reserved.

Impregnate describes the process mandated by the code with the phrase "other means during manufacture." The current Section 45.5.16.2.2 states the treatment is an integral part of the manufacturing process. A presentation by Benjamin Floyd and Alan Ross, Kop-Cote, Inc., at the 2010 Forest Products Society conference in Orlando, FL explains what integral means for wood treatments. It is "The term "integral treatments" refers to combining the active ingredients with the wood furnish (i.e., chips, flakes, strands, etc.) before processing." The dictionary definition of "impregnate" #3 shown above eliminates any confusion as to what the code expects for FRTW.

A review of the available literature shows all the testing done for acceptance of FRTW into the codes was performed on wood impregnated with chemicals. The testing ranged from small scale (ASTM E160), to large scale (ASTM E84 and E119) to full scale (White House, UL 1256 part 2).

The revision clarifies what is expected and eliminates possible confusion pertaining to the "other means during manufacture" statement.

Submitter Information Verification

Submitter Full Name: JOSEPH HOLLAND
Organization: HOOVER TREATED WOOD PRODUCTS
Affiliation: Hoover Treated Wood Products
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 02 15:42:57 EDT 2015
Committee Statement

Resolution: The definition is extracted from NFPA 703. NFPA 703 did not make any changes to the definition during the First Draft.
4.4.1 * Multiple Safeguards.

The design of every building or structure intended for human occupancy shall be such that reliance for property protection and safety to life does not depend solely on any single safeguard. An additional safeguard(s) shall be provided for property protection and life safety in case any single safeguard is ineffective due to inappropriate human actions, building failure, or system failure.

Statement of Problem and Substantiation for Public Input

"Inappropriate human actions" is vague and leave lots of room for varied interpretations.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 16:50:01 EDT 2015

Committee Statement

Resolution: Appropriate human actions should not render something inoperartive. The currently used word "inappropriate", although subjective, is appropriate for continued use in this provision.
Hazard Evaluation

4.5.8.1.1 Occupancies containing water-based fire protection systems shall be subject to evaluation to identify changes in the occupancy, hazard, water supply, storage commodity, storage arrangement, building modification, or other condition that affects the installation criteria of the system in accordance with table 4.5.8.1.1.

<table>
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<tr>
<th>Occupancy Classification</th>
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<tr>
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4.5.8.1.1.1 The evaluation required in 4.5.8.1.1 shall be performed by persons acceptable to the AHJ.

4.5.8.1.1.2 Where the evaluation reveals that the installed system is inadequate to protect the building or hazard in question, the property owner or designated representative shall make the required corrections. [ 25: 4.1.7.2 ]

Statement of Problem and Substantiation for Public Input

Changes in occupancy, use or process, or materials used or stored in the building are addressed by NFPA 25 and trigger the owner to have their system evaluated for its capacity to protect the new occupancy. At a minimum, this requires the owner to play an active role in the process by reporting these changes when they occur. Additionally it requires the owner to have specific knowledge of what is occurring in their building at all times, which may not always be the case. Examples of this include warehouse occupancies where spaces are leased and tenants often change. This can result in storage arrangements and/or commodities not contemplated during system design. System design is outside the scope of NFPA 25 and evaluating the system is not part of routine inspection, testing and maintenance required by that standard.

This proposal addresses the issue by ensuring that changes effecting sprinkler performance are identified on a set frequency rather than by chance and that the fire protection systems are capable of protecting the hazard.
Submitter Information Verification

Submitter Full Name: JEFFREY HUGO
Organization: NATIONAL FIRE SPRINKLER ASSOCIATION
Affiliation: NATIONAL FIRE SPRINKLER ASSOCIATION
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Jul 03 10:42:21 EDT 2015

Committee Statement

Resolution: Once a building receives its certificate of occupancy, the building code does not cover ongoing use without change. The subject would better be addressed by the fire code. For example, the provisions of Chapter 55, for fire protection systems and equipment, send the user to NFPA 1 for inspection, maintenance and testing. See 55.1.4.
4.5.8.1.1 Whenever impairments, critical deficiencies, or non-critical deficiencies are identified in water based fire protection systems maintained under NFPA 25, they shall be corrected in accordance with 4.5.8.1.1.1 through 4.5.8.1.1.3.

### 4.5.8.1.1.1* Impairments
Impairments shall be corrected or repaired immediately.

### 4.5.8.1.1.2* Critical Deficiencies

#### 4.5.8.1.1.2.1
Critical deficiencies shall be corrected or repaired within 30 days.

#### 4.5.8.1.1.2.2
Corrections or repairs shall be permitted to be made after 30 days if an approved corrective action plan is approved by the AHJ.

### 4.5.8.1.1.3* Non-Critical deficiencies

#### 4.5.8.1.1.3.1
Non-Critical deficiencies shall be corrected or repaired within 90 days.

#### 4.5.8.1.1.3.2
Corrections or repairs shall be permitted to be made after 90 days if an approved corrective action plan is approved by the AHJ.

---

**Statement of Problem and Substantiation for Public Input**

This language sets specific time frames for corrective action to remedy impairments, critical deficiencies, and non-critical deficiencies identified by NFPA 25. This language has also been proposed for NFPA 101 following 101:4.6.12.1.

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**Related Public Inputs for This Document**

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**Submitter Information Verification**

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<tr>
<th>Submitter Full Name:</th>
<th>ROBERT UPSON</th>
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<tr>
<td>Organization:</td>
<td>NATIONAL FIRE SPRINKLER ASSOCIATION</td>
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<tr>
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<td>National Fire Sprinkler Association</td>
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**Committee Statement**

Resolution: The subject is not a building code construction issue but, rather, a subject typically addressed by a fire code relative to ongoing use of a building.
Multiple occupancies, as defined in 6.2.2.1, shall comply with the requirements of the following all of the following requirements:

1. Subsection 6.2.1, and
2. Subsection 6.2.3, mixed occupancy requirements, or 6.2.4, separated occupancy requirements

Statement of Problem and Substantiation for Public Input

For clarification. This clarifies that all of the items are required.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 16:52:10 EDT 2015

Committee Statement

Resolution: FR-6076-NFPA 5000-2015
Statement: The reformatting clarifies which provision are applicable.
6.2.1.5
Where minor accessory uses secondary to the predominant occupancy do not occupy more than 25 percent of the area of any floor of a building, nor more than the basic area permitted for the occupancy by 7.4.2 for such minor use secondary uses, for the purpose of determining permitted area, the principal predominant use of the building floor shall determine the occupancy classification for the purpose of determining allowable area.

Statement of Problem and Substantiation for Public Input

First, this section was difficult to understand due to the sentence structure. Next, the term “minor accessory use” is confusing for several reasons. It is redundant to say “minor accessory.” Also, the term “accessory” has a legacy meaning in model building codes, which implies certain applicability versus another legacy term “incidental.”

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 16:54:20 EDT 2015

Committee Statement

Resolution: The suggested text does not help. It would confuse the issue. The term "minor accessory uses" is a legitimate term used in NFPA 5000.
Separation of occupancies having high hazard contents shall also be in accordance with 34.3.2.3 and 34.2.5.2 except as otherwise permitted by 6.2.4.7.

Table 6.2.4.1.1(a) Required Fire Resistance–Rated Separations for Separated Occupancies (hr)†, Part 1

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† Minimum Fire Resistance Rating. The fire resistance rating is permitted to be reduced by 1 hour, but in no case to less than 1 hour, where the building is protected throughout by an approved automatic sprinkler system in accordance with 55.3.1.1 (1) and electrically supervised in accordance with 55.3.2.

‡ The 1-hour reduction due to the presence of sprinklers in accordance with the double-dagger footnote is not permitted.

Table 6.2.4.1.1(b) Required Fire Resistance-Rated Separations for Separated Occupancies (hr‡, Part 2)
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<th>Apartment Buildings</th>
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<th>Board and Care, Large</th>
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Page 124 of 863
† **Minimum Fire Resistance Rating.** The fire resistance rating is permitted to be reduced by 1 hour, but in no case to less than 1 hour, where the building is protected throughout by an approved automatic sprinkler system in accordance with 55.3.1.1(1) and electrically supervised in accordance with 55.3.2.

‡ The 1-hour reduction due to the presence of sprinklers in accordance with the double-dagger footnote is not permitted.

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**Statement of Problem and Substantiation for Public Input**

This public input revises Table 6.2.4.1.1a by changing the entries for Assembly versus Education on all three from 2 to 0 because assembly uses within educational facilities are most likely non-simultaneous uses. The exiting and fire protection components required in the code provide sufficient safeguards making the fire separation unnecessary.

---

**Submitter Information Verification**

- **Submitter Full Name:** Jim Muir
- **Organization:** Building Safety Division, Clark County, Washington
- **Affiliation:** NFPA's Building Code Development Committee (BCDC)
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Sat Jul 04 16:58:18 EDT 2015

---

**Committee Statement**

- **Resolution:** The code user has the option of protecting a multiple occupancy building as Mixed Occupancies; there is no requirement to use the Separated Occupancies provisions. For example, where a school building includes both educational and assembly occupancies, the more stringent provisions - based on a comparison of those applicable to educational occupancies and those applicable to assembly occupancies - can be applied instead of separating the occupancies by fire-rated construction. "Non-simultaneous use" is not a practical assumption.
Public Input No. 5-NFPA 5000-2015 [ New Section after 6.4.2.9 ]

6.4.2.9. Animal Housing Facilities.

Area of a building or structure, including interior and adjacent exterior spaces, where animals are fed, rested, worked, exercised, treated, exhibited, or used for production shall be constructed in accordance with NFPA 150, Standard on Fire and Life Safety in Animal Housing Facilities.

Statement of Problem and Substantiation for Public Input

This would require a renumbering in Chapter 6 since this line item is already assigned to Cellulose Nitrate Motion Picture Film Storage.

Currently, NFPA 5000 recognizes only one type of animal housing facility, which is racetrack facilities and points to NFPA 150 for governing requirements. However, NFPA 150 is no longer limited to racetrack stable facilities but encompasses all animal housing facilities. In keeping with that, this PI proposes a new section for Animal Housing Facilities. A corresponding PI proposes the deletion of Racetrack Facilities from Chapter 6 since this new section would incorporate that specific type of facility as well as all other types of animal housing facilities.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: JOE SCIBETTA
Organization: BUILDINGREPORTS
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Feb 24 12:06:57 EST 2015

Committee Statement

Resolution: FR-6077-NFPA 5000-2015
Statement: The new provision for Animal Housing Facilities is a more general form of, and replacement for, 6.4.2.56 Racetrack Facilities relative to buildings housing animals. With this addition, current 6.4.2.56 is being deleted.
Public Input No. 6-NFPA 5000-2015 [ Section No. 6.4.2.56 ]

6.4.2.56 Racetrack Facilities.

Buildings and structures provided at racetracks, including those containing stalls for housing horses, human sleeping quarters, feed rooms, tack rooms, equipment storage rooms, blacksmith shops, kitchens, mechanical equipment rooms, and toilet facilities shall be constructed in accordance with NFPA 150, Standard on Fire and Life Safety in Animal Housing Facilities.

Reserved.

Statement of Problem and Substantiation for Public Input

See PI No. 5 for substantiation.

Related Public Inputs for This Document

<table>
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Submitter Information Verification

Submitter Full Name: JOE SCIBETTA
Organization: BUILDINGREPORTS
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Feb 24 12:15:23 EST 2015

Committee Statement

Resolution: FR-6078-NFPA 5000-2015

Statement: A new 6.2.4.9 for Animal Housing Facilities is being added. It is a more general form of, and replacement for, 6.4.2.56 Racetrack Facilities relative to buildings housing animals. With the addition of new 6.2.4.9, current 6.4.2.56 can be deleted.
7.1.4.2* Limited-Combustible Material.

A material shall be considered a limited-combustible material where both of the following conditions of 7.1.4.2 (1), and 7.1.4.2 (2), and the conditions of either 7.1.4.2.1 or 7.1.4.2.2 are met:

(1) The material does not comply with the requirements for a noncombustible material in accordance with 7.1.4.1.

(2) The material, in the form in which it is used, exhibits a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), when tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials.

7.1.4.2.1

The material shall have a structural base of noncombustible material with a surfacing not exceeding a thickness of \( \frac{1}{8} \) in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard for Test for Surface Burning Characteristics of Building Materials.

7.1.4.2.2

The material shall be composed of materials that in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E 84 or ANSI/UL 723 and are of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E 84 or ANSI/UL 723.

7.1.4.2.3

An alternate approach for a material to be considered a limited combustible material is where the material is tested in accordance with ASTM E2965, Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter at an incident heat flux of 75 kW/m\(^2\) for a 20 minute exposure and: (a) the peak heat release rate does not exceed 200 kW/m\(^2\) for longer than 10 seconds and (b) the total heat released does not exceed 8 MJ/m\(^2\).

7.1.4.2.4

Where the term limited-combustible is used in this Code, it shall also include the term noncombustible.

(also, add ASTM E2965, Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter, 2015, into section 2.3.11 on ASTM publications)
Statement of Problem and Substantiation for Public Input

For many years there have been debates about using modern technology to assess whether a material provides very little added fire hazard compared to a non-combustible material. The technology used in NFPA 101 and in NFPA 5000 is based on NFPA 259 and ASTM E84, both venerable tests of 1950s vintage.

Task Group E05.23.01 first met in December of 1987 at the ASTM E05 meeting in Bar Harbor, FL. The Task Group was charged with the development of an ASTM standard test method to measure degrees of combustibility based on heat release rate. The history of the development of that work is presented below.

1. The idea to use small-scale heat release rate data as a measure of the combustibility of a product was first proposed by Prof. Ed Smith at Ohio State University. This effort later resulted in the development of the Ohio State University (OSU) calorimeter (standardized as ASTM E906 and used by the FAA for regulatory purposes of large surfaces in aircraft).

2. The first attempt at developing a standard describing a method to measure combustibility of products on the basis of heat release rate was made in Canada. Task Group No. 22 of the Underwriters' Laboratories of Canada (ULC) Committee on Fire Tests was formed in 1980 to develop a test method to evaluate building products in terms of degrees of combustibility. Initially, the ULC Task Group considered modifying the standard test method for non-combustibility of building products (CAN/ULC-S114) to obtain quantitative measurements suitable for ranking products in terms of degrees of combustibility. Attempts were made to rank products on the basis of maximum temperature rise and the area under the temperature-time curves. After a series of round-robin tests, it was the consensus of the Task Group that the non-combustibility furnace was not suitable. This was consistent with the results of a study conducted in Finland which concluded that there is no consistency between the temperature rise measurements in the ISO 1182 non-combustibility furnace and heat release rate measured on the basis of oxygen consumption. In addition, the Task Group considered the CAN/ULC-S114 method to be somewhat limited for the following reasons:
   a. A quantitative measurement is preferable to a pass/fail type test;
   b. Heating of one surface of a specimen is preferable to heating of a block of material; and
   c. The CAN/ULC-S114 test is limited to elementary building materials, and a test method applicable to composite products is preferable.

3. Work was done at the National Research Council of Canada (NRCC) to explore the use of the OSU calorimeter for measuring degrees of combustibility. The OSU apparatus at NRCC was equipped with oxygen consumption instrumentation, and the airflow through the apparatus was reduced to half the flow prescribed in the ASTM E 906 and FAA versions of the test method to increase accuracy and sensitivity of the heat release rate measurements. Four products were tested with heat release rates ranging from 8 to 300 kW/m².

4. Around the same time, Forintek Canada Corporation explored the use of the Cone Calorimeter for measuring degrees of combustibility. Seventeen different products were tested in the horizontal and vertical orientation at 40 and 50 kW/m². The lower heat flux level was chosen to obtain results that could be compared to the modified OSU data from the NRCC study. The higher heat flux level was chosen to be comparable to the irradiance in the CAN/ULC-S114 test, since 50 kW/m² is equal to the radiative heat flux from a blackbody source at 700°C.

5. The work of the ULC Task Group resulted in a new standard test method CAN/ULC-S135, “Standard Method for Determination of Degrees of Combustibility of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter).” The standard was published in 1992, and was largely based on the research conducted at Forintek. The method described in CAN/ULC-S135 is nearly identical to that in ASTM E 1354, except for the following important modifications:
   a. A different specimen holder is used so that the bottom and the sides of the specimen are insulated with ceramic fiber blanket;
   b. The test duration is fixed at 15 min;
c. Mass loss measurements are optional; and
d. Smoke obscuration measurements are not included.

Products are tested in triplicate, in the horizontal orientation, at a heat flux of 50 kW/m², and with the spark igniter. Several proposals have been published for a classification system based on CAN/ULC-S135 test performance and its incorporation into the building codes. Chen et al., in Taiwan, evaluated 18 products in the Cone Calorimeter according to the test procedure in CAN/ULC S135, but with the horizontal specimen holder specified in ASTM E 1354. The results from this study were consistent with earlier work at Forintek, and qualitative agreement was found between CNS 6532 (equivalent to JIS 1321) and the classification system proposed by Richardson and Brooks.

6. In October 1992, the Board for the Coordination of the Model Codes (BCMC) formed a Task Group to work on new definitions for the terms “Non-Combustible”, “Limited Combustible”, and “Combustible”. Following general discussions of the issue over the first year after its formation, the BCMC Combustibility Task Group decided to pursue the development of a system of “degrees of combustibility” akin to a proposal under consideration in Canada based on results obtained from Cone Calorimeter tests performed according to CAN/ULC S135.

7. At the March 1994 BCMC Task Group meeting, it was decided to use the Cone Calorimeter as described in ASTM E 1354. A Subcommittee was formed to look at the details of the test procedure and formulate a proposal. The Subcommittee met in April 1994, and presented its report at the Task Group meeting in June 1994. The Subcommittee recommended the BCMC test protocol call for
   a. An irradiance level of 75 kW/m²;  
b. Testing in the horizontal orientation;  
c. Mandatory use of the retainer frame described in ASTM E 1354;  
d. Use of the spark plug ignition pilot;  
e. Measurements every two seconds;  
f. A fixed test duration of 15 minutes; and  
g. Other test and reporting details as in ASTM E 1354.

   The BCMC protocol is significantly different from that described in CAN/ULC 5135. Most of the deviations from the Canadian standard were motivated by NIST recommendations made a few years earlier. After lengthy discussion, the Task Group accepted the proposed protocol and disbanded the Subcommittee.

8. Subsequently, a new Subcommittee was formed to develop a database of Cone Calorimeter measurements obtained under test conditions comparable to those specified by the BCMC protocol. In addition, the Subcommittee was instructed to determine feasibility of the development of a classification system of four or five degrees of combustibility on the basis of the database. The Subcommittee collected Cone Calorimeter data obtained at 75 kW/m² in the horizontal orientation for 111 products, and organized the data in tabular form and in bar charts. Most of the data were obtained at NIST. Strictly speaking, none of these tests were conducted according to the BCMC protocol, since all tests were run with a five second interval between measurements. However, the reduction from five to two seconds only results in better precision of the maximum heat release rate. The retainer frame was used for less than 10 percent of the tests in the database. Research has shown that the heat sink effect of the frame can be accounted for by reducing heat release rate data obtained without the frame by approximately 6 percent [10-11]. Therefore, it was agreed that the test conditions were close enough to those prescribed by the BCMC protocol so that valid conclusions could be reached concerning the feasibility question.

9. The Subcommittee analyzed the data in detail at a meeting in April 1995. It was concluded that there are sufficient Cone Calorimeter data so that a classification system for degrees of combustibility can be developed. Proposed class limits were based on two limiting values; total heat release, and the maximum of a one-minute sliding average heat release rate. Some Subcommittee members questioned whether the precision of the Cone Calorimeter is sufficient to justify regulatory use of the test method. The concern was based on poor reproducibility estimated from a recent Cone Calorimeter round robin conducted under the auspices of the ASTM Institute for Standards Research.
In addition, significant discrepancies were found between two laboratories in the U.S. for identical gypsum board specimens tested under the same conditions. The Subcommittee also identified the need to quantify the effect of the retainer frame more precisely.

10. The Subcommittee presented its findings to the Task Group at a meeting in June, 1995. The Task Group instructed the Subcommittee to organize a Cone Calorimeter round robin with the purpose of determining the precision of the instrument specifically for the BCMC test protocol. The Subcommittee was asked to focus on the commercial testing laboratories in North America, and to present a detailed plan (products, participating laboratories, time schedule, etc.) at the next BCMC Task Group meeting in October, 1995. The Task Group formed a new Subcommittee to develop a strategy for implementation of a system for degrees of combustibility in the model codes. Unfortunately, BCMC was disbanded shortly after the October 1995 meeting, resulting in an unclear future for the test project. However, at the same time the Board for the Development of a Model Code (BDMC) was formed by the International Code Council (ICC) to pick up many of the activities of the Council of American Building Officials (CABO), including those of the BCMC. The BDMC decided to maintain the BCMC activities in the area of combustibility. In a memorandum to interested parties from the BDMC secretariat dated May 29, 1996 it was stated that "... The round robin tests are required to document test results and address the repeatability and reproducibility issue of the test method. Conducting the round robin tests in accordance with the BDMC protocol and analyzing the data is pertinent to this project. Until financial support or other means are obtained to proceed with the round robin tests in accordance with the BDMC protocol, no time frame for completion by the task group can be established and therefore, there can be no further activity on this BDMC agenda item."

11 In April, 1996 the NFPA Fire Tests Committee discussed a proposal describing the use of the Cone Calorimeter for determining degrees of combustibility of products according to the protocol developed by the BCMC. After lengthy discussion, the Committee voted on a motion to support the proposal. The outcome was undecided, and a Task Group was formed to review the issue and to make a recommendation to the Committee at its next meeting in October 1996. Since no new information had been obtained since the BCMC was disbanded, the NFPA Task Group reached the same conclusion as the BCMC Combustibility Task Group did one year earlier, i.e., that there is a need for a series of interlaboratory tests to determine the precision of the test method for this application.

12. In the spring of 1997 the Pacific Fire Laboratory (PFL) took the initiative to prepare a proposal for the round robin to prospective sponsors. The following seven organizations joined the project: American Forest & Paper Association, Armstrong World Industries, Inc., Atlas Electric Devices Company, Canadian Wood Council, Cellulose Insulation Manufacturers Association, W.R. Grace & Company, and Wilsonart International Inc. Representatives of sponsors and four participating commercial laboratories together with Dr. Joe Urbas, the project coordinator, formed the "Cone Calorimeter Round Robin Consortium" (Consortium) to organize the project. The Consortium defined the scope of the project, selected the products to be tested, confirmed the participating laboratories, defined the calibration procedure, and confirmed the test protocol. according to the protocol developed by the Board for the Coordination of the Model Codes (BCMC). All laboratories first performed extensive calibrations of their equipment, and conducted preliminary tests on two reference products (black PMMA with a relatively high heat release output and mineral ceiling board with a relatively low heat release output). The calibration and reference test data were used to correct minor discrepancies and inconsistencies prior to the round robin tests. Sixteen building products covering a wide range of heat release rates were tested in triplicate by each laboratory according to the BCMC protocol. All testing was completed by the summer of 1998, and it took approximately 18 months to analyze and review the data and to finalize the report. The sponsors finally released the report in the spring of 2000. The precision data presented in the report are comparable to those obtained in earlier round robins as reported in the ISO, ASTM, and other Cone Calorimeter standards, and are valid for a wider range of heat release rates.

13. Over the years since its inception the ASTM Task Group E05.23.01 continuously monitored activities pertinent to the use of the Cone Calorimeter for measuring degrees of combustibility of products. A first draft based on the BCMC protocol was distributed at the New Orleans Task Group
meeting in December 1999.

14. Legislation was introduced into several countries, including Canada, Japan and Taiwan, to regulate "quasi non combustible materials" using the cone calorimeter (ASTM E1354 or ISO 5660). A concern that was expressed frequently was that the errors were similar in order of magnitude to the measurements needed.

15. Work was initiated in ISO TC92 SC1 to develop a variation of the cone calorimeter, ISO 5660-4, that could be used for such low heat release measurements.

16. It was later discovered that a larger cone heater and a larger test specimen were needed in order to get the variability of the measurement to become significantly smaller than the required measured values. Other concerns were related to drift of the signal and noise. Work was conducted in England by Sean Gregory et al. (manuscript attached) to solve these problems. This concept was first introduced into ASTM in 2011 and balloted at that time. Several subsequent ballots followed, refining the procedure, with special emphasis on issues such as flow rate and capturing the entirety of the smoke emitted, which required a larger hood.

17. A successful ballot was completed earlier this year and standard E2965, Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter, has been approved.

18. The criteria proposed are based on the Japanese criteria, with a higher incident heat flux (75 kW/m² instead of 50 kW/m²) so that any materials that would meet the requirements would contain almost no combustible content.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER  
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State:  
Zip:  
Submittal Date: Wed Jun 24 21:06:08 EDT 2015

Committee Statement

Resolution: The committee agrees (philosophically) with the allowance to use an alternative test. The committee did not do an FR on this subject for the following reasons. 1. Uncertain if the 200kW m² value is the appropriate pass/fail mark or if 100 kW/m² is better. 2. How does this new test correlate to the existing test standards that are currently in use? In other words, is the performance level being revised substantially by introduction of the new test? 3. Should the test include multiple incident heat fluxes so that a heat release parameter can be determined. 4. The committee is not familiar with the Japanese/ISO test procedures that are referenced.
USE OF THE CONE CALORIMETER FOR TESTING MATERIALS WITH LOW HEAT RELEASE RATES

Sean Gregory, A Green, S Pasantes Fire Testing Technology Ltd, S Grayson, S Kumar, Interscience Communications Ltd, UK

ABSTRACT

The ISO 5660\textsuperscript{1} and ASTM E1354\textsuperscript{2} cone calorimeter developed by Babrauskas was designed to measure heat release from combustible materials such as wood plastics and building products. These typically have peak HRR of 250–2000 kW/m\textsuperscript{2}. The results were either used directly or as data for numerical models.

Japan and Canada have already issued standards and regulate using heat release measurements based on Cone calorimeter data generated using protocol and apparatus similar to that outlined in ISO 5660-1. The Japanese usage of the ISO 5660-1 along with the performance limits (peak HRR must not exceed 200kW/m\textsuperscript{2} and total HRR in 20 mins should not exceed 8 MJ/m\textsuperscript{2}) has shown that test protocol and apparatus specifications outlined in ISO 5660 can lead to “within standard allowable” errors that constitute a significant fraction of the allowable performance levels.

ISO 5660 analyser specification allows for 50ppm analyser drift and 50ppm noise, which could translate to 3–4 MJ errors. This would only amount to 0.3% on a typical 1000MJ/m\textsuperscript{2} material but 40–50% of the 8MJ/m\textsuperscript{2} required by Japanese regulations.

In our study reported in 2005\textsuperscript{3} we identified need for improvement measurement by:

- Reducing analyser noise and drift by specifying a lower performance requirement
- Tighten laboratory practice to remove interfering influences
- Increasing the oxygen depletion levels

This paper identifies improvement areas in all of the above but most specifically addresses the topic of increasing oxygen depletion levels. One major advance is facilitated by use of a larger cone heater in the apparatus which gives a uniform heat flux over the whole surface area of a much larger (150 x 150mm specimen). ISO 5660 and ASTM require that the “The irradiance shall be uniform within the central 50mm x 50mm area of the exposed specimen surface, to within ±2%”. The larger cone-shaped radiant electric heater gives a uniform irradiance across the whole of the a 150mm x 150mm sample to within 1.89%.

Thermal mapping of the areas under the cone heater has shown that the whole zones are considerably more thermally uniform and that best baseplate – specimen range for uniformity of heat flux across the specimen surface is approx. 60mm. This gives added advantage to this system when testing distorting or intumescent specimens as they can be more easily accommodated within this geometry whilst deforming. The larger cone can be readily accommodated within the existing cone calorimeter geometries and constitutes a simple modification.
INTRODUCTION

Non-combustibility has traditionally been used in building regulations in several countries and this has been assessed using tests similar to EN ISO 1182: 2002. The heat of combustion as determined in bomb calorimetry, EN ISO 1716: 2002 has also been used.

The exposure conditions in the Non-combustibility test and in the bomb calorimeter are both unrealistic and not representative of what happens in a fire. Both tests use very small sample sizes and cannot accommodate complex (laminated) or painted specimens. Neither test takes into account the dynamic nature and growth of a fire hazard or measures the HRR. The limitations of these test methods have lead to the realization that in applications where a materials’ low level of combustibility is needed the parameter that should be measured is the HRR. The Cone Calorimeter is widely accepted as the most appropriate apparatus for this application.

In the early 1990s, NIST (USA); BASF(Germany); and Forintek (Canada) performed a programme examining the HRR behaviour of an assortment of specimens, which were then known to be, or not to be, acceptable to building codes as ‘non-combustible’. The Forintek results suggested that cone calorimeter testing at an irradiance of 50 kW/m² (horizontal) could rate products correctly. They used limits of peak $\dot{q} < 80$ kW/m² and a heat content $< 8$ MJ/m². Further work was done in 1997 led by Urbas and Janssens found that the Cone Calorimeter was suitable for measuring heat release rate from materials and products with low heat content though none of the materials they investigated were classed as ‘non-combustible’ by the more established tests.

More recently the Cone Calorimeter has been accepted as a regulatory tool in Japan and Canada for assessing the limited combustibility of building materials based on heat release measurements. ISO/TC92/SC1/WG5 has started work developing a test method for limited combustibility which stalled because it utilised the larger product testing initially reported by Grayson et al because the specimens were exposed to a none uniform heat flux exposure. This paper describes the subsequent development of a larger cone heater system which can be substituted within the ISO 5660/ ASTM 1354 system to overcome this shortfall and will allow low levels of heat release to be confidently measured at these levels.

INHERENT NOISE AND DRIFT ISSUES AND THEIR EFFECT ON SIGNAL : NOISE RATIO

The Japanese regulations requires that a Cone Calorimeter test be conducted at 50 kW/m² in accordance with ISO 5660-1 and that the peak HRR and THR be calculated at 5 minutes and/or 20 minutes exposure. The results at 5 minutes are for "low grade flammability materials" and the results at 20 minutes for "high grade flammability materials". The criteria limits of the test are that peak HRR must not exceed 200 kW/m² for longer than 10 seconds and THR must be less than 8 MJ/m² over 20 minutes from the start of the test. The analyser specifications outlined in ISO 5660-1 can lead to “allowable” errors that constitute a significant fraction of the allowable performance levels. Though laboratories with very good protocols and high sensitivity analysers can meet these standards others are struggling to do so.

These errors are usually a function of the inherent noise and drift performance of the analysers. However, when working at this level of sensitivity, laboratory practise, testing protocols especially maintenance of desiccant procedures etc. need to be adhered to and/or modified to reduce drift in particular. We previously described how the ISO 5660-1 oxygen analyser specification allows a drift of not more than 50 parts per million of oxygen over a period of 30 min, and a noise of not more than 50 parts per million of oxygen during this 30 min period and we explained that analysers
operating at the limits of this performance would lead to errors in HRR measurement of 1.0 MJ/m\(^2\) if the drift was linear, and up to, 3.2 MJ/m\(^2\) under an extreme step change of 50ppm

In addition to inherent analyser drift and noise levels, further drifting may occur from poor operational maintenance or poor testing protocols.

**METHODS OF IMPROVING THE RESOLUTION AND MEASUREMENT**

With so little margin between the performance requirements and the sensitivity of inherent errors in the ISO 5660 system there is need for significant improvement, both to the apparatus and the procedures used when measuring low heat release rates. These are specifically

- Reduction in analyser drift
- Reduction in analyser noise
- Improved laboratory practice
- Increasing the signal at the oxygen analyser (i.e., making the oxygen depletion bigger)

**Reducing Drift**

All analysers drift. This is a function of the analyser electronics, the gas sampling system, the sample gas itself, pressure (in the gas sample line and atmosphere), temperature etc. Analyser manufacturers are able to produce consistently lower drift analysers at a premium, i.e. temperature controlled and pressure compensated cells, which will bring them within the given tolerance but if the gas sampling system or the sample gas itself are not monitored the baseline oxygen concentration will eventually drift.

![Figure 1: High performance ISO 5660-1 analyser](image)

Figure 1 shows a ISO 5660-1 compliant high performance oxygen analyser operating with a noise level of 10.7ppm and a drift of 15ppm. This could lead to a potential analyser induced error of 0.13MJ/m\(^2\) in results. This is only 1.6% of the Japanese 8 MJ/m\(^2\) limit. Even such an analyser would exhibit further drift if the laboratory protocols outlined below were not adhered to.
Reducing Noise

The primary sources of noise are the oxygen analyser and the differential pressure measurement taken across the orifice. The noise from the oxygen analyser is a function of the oxygen cell, the electronics in the analyser, and the electronic time constant of the analyser which in turn affects its response time. (Consequently there is a balance between noise and response time, typically the quicker the response time the larger the noise.) The differential pressure around the orifice is turbulent and produces a noisy signal. However, electrical damping of the signal would reduce the effect this has on the HRR.

Improve Laboratory Practice

Laboratory practices and calibrations described in ISO 5660-1 need to be astringently adhered to and maintained at their highest levels when testing for low heat release measurement. Ensure that regular calibrations are made and that any of the influences that particularly lead to drift are minimised.

Not removing all the water vapour from the gas sample is perhaps the largest source of drift. This is normally a function of poor maintenance of moisture traps and/or drying desiccants or resultant of the filter system becoming saturated with soot and restricting the flow beyond the pressure compensation capability of the analyser. In addition, systems are fitted with pressure and flow regulation instrumentation (e.g. pressure relief valve) which, if not operating correctly, may be an additional source of drift and noise.

Another common cause of drift is due to the ambient oxygen concentration actually changing in the immediate vicinity of the Cone Calorimeter. This can be as a result of other oxygen consuming experiments being operated simultaneously with the experiment or simply the oxygen consumption and carbon dioxide generation by a group of spectators close to the apparatus situated in a confined space.

Increasing the signal

Increasing the level of oxygen depletion measured for the same material whilst not affecting the noise or drift, would increase the signal to noise ratio and hence reduce the effect of noise and drift. This is the development most likely to facilitate better measurements and can be achieved by changing any or all of the following:

- Using Lower Flow Rates Through The Duct

The ISO 5660-1 flow rate used in the Cone Calorimeter is 24 l/s. This was found to be sufficient to remove all combustion products without increasing the rate of combustion of the specimen. The duct and orifice diameter were designed to accommodate this flow rate. The combustion gases from less combustible materials could be collected using a lower flow rate. The limit to reducing the flow is when it becomes none turbulent. This is at a flow rate of approximately 10 l/s. This could be reduced further if a smaller diameter duct and orifice plate is fitted. We earlier reported successful reduction of standard cone calorimeter duct flows to 12.5 l/s and are now recommending that this be adopted in the developing standards for low heat release rate measurement.

- Testing at higher heat fluxes

Materials generally give off more heat when tested at higher heat fluxes. Although there has been considerable debate about whether to use a heat flux of 50kW/m² or 75 kW/m² within ISO TC92, the higher heat flux would be a better measurement choice as the specimen is likely to have a higher HRR
in turn increasing the level of oxygen depletion. Any increase in heat flux would require this to be taken into consideration in any existing regulations (e.g. the Japanese).

- Using Larger Specimens

If a specimen size was increased then the level of oxygen depletion and the signal would be increased proportionately. A specimen measuring 150 mm × 150mm should give a signal 2.25 times bigger than the standard 100mm × 100mm specimen. This was part of the approach being studied in ISO TC 92/SC1/WG5 to develop the standard ‘Determination of Low Level of Combustibility using an Oxygen Consumption Calorimeter (Cone Calorimeter)’.

One disadvantage of using larger specimens with the ISO 5660-1 cone heater is that the larger specimen would not experience the same uniform heat flux across the surface that we find in standard cone specimens. Figure 2 shows the heat flux levels received at the four corners and centre of both a 100mm × 100mm and a 150mm × 150mm specimen when located 25mm below the cone heater. The heat flux drops by more than 60% at the corners of the larger specimens. Though the same reduction in the heat flux at the corners of the sample would be produced by all cone heaters and the results for the same material should still be both repeatable and reproducible ISO TC92 decided that it was inappropriate to standardise this as TC92 was tasked to develop methods that could be used for fire safety engineering application. This none uniform exposure would prevent the results being used efficiently in models.

![Figure 2: Heat Flux Profile of large and standard specimens with ISO 5660 cone heater](image)

A larger conical heater has now been developed and that can be readily housed in the ISO 5660-1 chassis (see figure 3). This has been tested and shown to deliver a uniformity of performance across the whole surface of this larger 150 x 150 mm specimen that exceeds the uniform surface heat flux requirements specified in ISO 5660-1 and ASTM E1354
ISO 5660-1 and ASTM E1354 data is widely used for the fire safety engineering applications and both specify an incident specimen surface uniformity from the cone heater such that the heat flux uniformity within the central (50mm × 50mm) area of the exposed specimen surface, be uniform to within ±2%. Extrapolation of these requirements from the specimen size of 100mm square to the larger 150 x150mm specimen, would require that “the irradiance should be uniform within the central 75mm × 75mm area of the exposed specimen surface, to within ±2%”

Heat flux mapping with the larger cone heater determined the heat flux at the specimen position covariance, for a central 75mm × 75mm and across the full specimen 150mm × 150mm, both for 25 mm and 60mm separations between the cone baseplate and the specimen surface. Results are given in Figure 4 which shows the results for the large cone heater mappings. The large cone far out performs the requirement for the central 50 x 50mm zone of the ISO 5660-1 specimen surface, not only in the 75mm x 75mm central zone, but also over the whole 150mm x 150mm specimen area.
<table>
<thead>
<tr>
<th></th>
<th>75mm × 7mm</th>
<th>150mm × 150mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>25mm separation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average (kW/m²)</td>
<td>50.4</td>
<td>51.0</td>
</tr>
<tr>
<td>Standard deviation (kW/m²)</td>
<td>0.492</td>
<td>0.755</td>
</tr>
<tr>
<td>Covariance</td>
<td>0.98%</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>60mm separation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average (kW/m²)</td>
<td>50.57</td>
<td>50.03</td>
</tr>
<tr>
<td>Standard deviation (kW/m²)</td>
<td>0.543</td>
<td>1.00</td>
</tr>
<tr>
<td>Covariance</td>
<td>1.1%</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

Figure 4 Heat Flux Uniformity at 25mm and 60mm

The heat flux profile across the specimen, when measured at 60mm separation between the specimen surface and the cone baseplate, is more typical of the heat flux mapping measured below a standard sized cone calorimeter at 25mm separation. At 25mm separation the heat flux below the large cone increases as the offset from the vertical centre line increases.

Figure 5. Large format cone heater Heat flux variation across specimen surface for 25mm and 60mm cone base plate – specimen surface separations

Figure 6 and 7 show the heat flux mappings of the larger format cone heater at 60mm and 25mm cone baseplate – specimen surface separations respectively. This can be favourably compared with the mapping with the ISO 5660-1 cone heater in Figure 2. This data shows that the new format heater, not only satisfies the fire safety engineering requirement of ISO 5660-1 but far exceed the
performance of the ISO 5660-1 cone heater in overall uniformity of heat flux delivered. This
uniformity is also found over a deeper zone from the cone baseplate which means that thermally
mobile materials (i.e. intumescent or collapsing specimens) would be exposed to a more uniform heat
flux during their deformed period of the testing.

![Figure 6: Large cone heater format - Heat flux variation across specimen surface for 60mm cone base plate – specimen surface separation](image1)

![Figure 7: Large cone heater format - Heat flux variation across specimen surface for 25mm cone baseplate – specimen surface separation](image2)

The larger cone heater is readily retrofitted to existing cone calorimeters with minor supplementary
thermal insulation board being precautionary added to the Chassis Figure 8).
This larger cone heater development along with the use of lower exhausted rates and tighter specifications on the oxygen analysers (30ppm noise and drift) facilitate the basis of a sound standard to measure low heat release rate measurement.

**COMPARISON OF RESULTS FROM LARGE AND ISO 5660 CONE HEATERS**

A short study was made to compare the performance and results from 100 x 100mm specimens tested using the standard ISO 5660 cone calorimeter and those from 150 x 150 mm specimens tested using the larger format cone heater. All testing was at 50 kW/m². All tests were performed with a sampling interval of 1 s, and a nominal exhaust flow rate of 24 l/s

Plasterboard and a low combustibility ceiling tile were tested as they respectively represented very low heat release materials with a combustible surface layer (ie layered specimens) and a homogenous low heat release specimen.

Figure 9 to 12 show the heat release curves of test with the ISO 5660-1 cone and specimens, and those of the larger 150 x 150mm specimens tested with the larger cone heater respectively. Figures 13 and 14 give the tabulated test results of the Average Heat Release Rate over the test time, the Peak heat release rate and the total heat release rate calculated over the test time and also the time intervals 0-300s, 0-600s and 0-1200s. Means Standard deviation and coefficient of variance of each set are also given. These show that the larger and smaller cone formats give similar results when, as in these tests the analysers were well within specifications with minimal drift, and sound laboratory protocols being exacted on the ISO 5660-1 tests. The heat release curves show the much less noisy signals being generated by the larger cone and specimens.
<table>
<thead>
<tr>
<th>Cone</th>
<th>Size</th>
<th>Mean HRR (kW/m²)</th>
<th>Peak HRR (kW/m²)</th>
<th>THR (MJ/m³)</th>
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</thead>
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<tr>
<td></td>
<td>Test time</td>
<td>0-300s</td>
<td>0-600s</td>
<td>0-1200s</td>
</tr>
<tr>
<td>Standard</td>
<td>Test 1</td>
<td>11.63</td>
<td>117.38</td>
<td>3.07</td>
</tr>
<tr>
<td>cone</td>
<td>Test 2</td>
<td>8.64</td>
<td>110.51</td>
<td>2.25</td>
</tr>
<tr>
<td>100x100</td>
<td>Test 3</td>
<td>9.10</td>
<td>122.98</td>
<td>2.46</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>9.79</td>
<td>116.95</td>
<td>2.59</td>
</tr>
<tr>
<td>STD</td>
<td></td>
<td>1.61</td>
<td>6.25</td>
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</tr>
<tr>
<td>COV</td>
<td></td>
<td>16.43%</td>
<td>5.34%</td>
<td>16.53%</td>
</tr>
<tr>
<td>Large</td>
<td>Test 1</td>
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<td>103.51</td>
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<tr>
<td>cone</td>
<td>Test 2</td>
<td>8.04</td>
<td>129.94</td>
<td>2.15</td>
</tr>
<tr>
<td>150x150</td>
<td>Test 3</td>
<td>8.39</td>
<td>119.94</td>
<td>2.26</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>7.99</td>
<td>117.80</td>
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</tr>
<tr>
<td>STD</td>
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<td>0.42</td>
<td>13.35</td>
<td>0.14</td>
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<td>COV</td>
<td></td>
<td>5.24%</td>
<td>11.33%</td>
<td>6.54%</td>
</tr>
</tbody>
</table>

Figure 9 Plaster board tested in Standard ISO 5660-1

Figure 10 Plaster board tested in Larger Heater & Specimen

Figure 11 Ceiling Tile tested in Standard ISO 5660-1

Figure 12 Ceiling Tile tested in Standard ISO 5660-1

Figure 13 Plasterboard tested in Standard ISO 5660-1 and larger heater/specimen set up
### Table

<table>
<thead>
<tr>
<th>Cone size</th>
<th>Mean HRR (kW/m²)</th>
<th>Peak HRR (kW/m²)</th>
<th>THR (MJ/m²)</th>
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<td></td>
<td></td>
<td></td>
<td>Test time</td>
</tr>
<tr>
<td>standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test 1</td>
<td>7.17</td>
<td>13.69</td>
<td>2.15</td>
</tr>
<tr>
<td>Test 2</td>
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<td>100x100</td>
<td>3.57</td>
<td>11.15</td>
<td>4.68</td>
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<td>Test 3</td>
<td>6.18</td>
<td>11.00</td>
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<tr>
<td>Mean</td>
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<td>3.18</td>
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<td>1.34</td>
<td>1.07</td>
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<tr>
<td>Test 1</td>
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<td>11.61</td>
<td>3.74</td>
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<td>Test 2</td>
<td>3.76</td>
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<td>12.76</td>
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<tr>
<td>Mean</td>
<td>3.84</td>
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<tr>
<td>STD</td>
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<td>0.79</td>
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<tr>
<td>COV</td>
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Figure 14 Ceiling Tile tested in Standard ISO 5660-1 and larger heater/specimen set up

### CONCLUSION FUTURE DEVELOPMENTS

The larger specimen tested in conjunction with the larger cone heater give similar results to those from high specification ISO 5660-1 cone testing but show stronger signals with much lower noise levels. The latter will be of particular value when the specimens are recording heat release very close to the baseline.

Further enhancements are being worked upon and are listed below

- Reducing analyser drift by specifying lower performance requirement
- Testing at higher heat fluxes
- Tightening laboratory practice to remove interfering influences i.e. Minimise ambient oxygen changes during tests; Ensure gas conditioning system is functioning efficiently i.e. all sampling lines are kept dry
- Using lower flow extraction flow rates (12.5 l/s instead of 24 l/s)
- Using larger specimens

Both ISO and ASTM are now developing standards based on this larger format cone heater that will facilitate the accurate measurement of low levels of heat release in a cone calorimeter systems by increasing the signal to noise ratio by the listed methods.

### REFERENCES


4 Reaction to fire tests for building products – Non-combustibility test (EN ISO 1182: 2002).

5 Reaction to fire tests for building products - Determination of the heat of combustion (EN ISO 1716: 2002).


7 Janssens, M., K Carpenter, ‘Using Heat Release Rate to Assess Combustibility of Building Products in the Cone Calorimeter’. DRAFT –Submitted to Fire Technology – 11/04. Department of Fire Technology, Southwest Research Institute, USA.
7.2.5.6.8 Exterior Nonbearing Walls.

Exterior nonbearing walls tested shall be permitted when tested in accordance with, and meeting the conditions of acceptance of, either one of the following:


Statement of Problem and Substantiation for Public Input

This proposed code change offers a nationally accepted fire test (ANSI/FM 4880) as an alternative to NFPA 285. As evidenced by a peer reviewed journal article (SFPE) and Phase 1 of an FPRF study, ANSI/FM 4880 is a more stringent test than NFPA 285 so there is no reason to question the adequacy of ANSI/FM 4880. ANSI/FM 4880 is already referenced in H.1.2.11.

The following will be made available:


The FPRF study referenced is available through NFPA.

Submitter Information Verification

Submitter Full Name: RICHARD DAVIS
Organization: FM GLOBAL
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 12:08:02 EDT 2015

Committee Statement

Resolution: FR-1001-NFPA 5000-2015
Statement: This proposed code change offers a nationally accepted fire test (ANSI/FM 4880) as an alternative to NFPA 285. As evidenced by a peer reviewed journal article (SFPE) and Phase 1 of an FPRF study, ANSI/FM 4880 is a more stringent test than NFPA 285 so there is no reason to question the adequacy of ANSI/FM 4880. ANSI/FM 4880 is already referenced in H.1.2.11.
7.4.3.6.5 Enclosed Parking Structures with Occupancies Above.

A basement or first story above grade plane of a building shall be considered as a separate and distinct building for the purpose of determining the limitation on number of stories and construction type, provided that all of the following conditions are met:

(1) The basement or first story above grade plane shall be of Type I construction and shall be separated from the building above with a horizontal assembly having a minimum 3-hour fire resistance rating.

(2) Shaft, stairway, ramp, or escalator enclosures through the horizontal assembly shall comply with either of the following conditions:

(3) The enclosures shall have not less than a 2-hour fire resistance rating with opening protectives in accordance with Table 8.7.2.

(4) Where the walls below the horizontal assembly have a minimum 3-hour fire resistance rating with opening protectives as required for walls forming a 3-hour fire barrier, the enclosure walls extending above the horizontal assembly shall be permitted to have a 1-hour fire resistance rating, provided that all of the following conditions are met:

(5) The building above the horizontal assembly is not required to be of Type I construction.

(6) The enclosure connects less than four stories above the horizontal assembly.

(7) The enclosure opening protectives above the horizontal assembly have a minimum 1-hour fire protection rating.

(8) The building above the horizontal assembly shall contain only business, mercantile, storage, or residential occupancies or assembly occupancies having an assembly room with an occupant load of less than 300.

(9) The building below the horizontal assembly shall be an enclosed or open parking structure used for the parking and storage of private motor vehicles, unless otherwise permitted by the following:

(10) Entry lobbies, mechanical rooms, and similar uses incidental to the operation of the building shall be permitted.

(11) Business, mercantile, and assembly occupancies having an assembly room with an occupant load of less than 300 shall be permitted in addition to those uses incidental to the operation of the building (including storage areas), provided that the entire structure below the horizontal assembly is protected throughout by an approved, electrically supervised automatic sprinkler system installed in accordance with NFPA 13.

(12) The maximum building height in feet shall not exceed the limits set forth in Table 7.4.1 for the least restrictive type of construction involved.

Statement of Problem and Substantiation for Public Input

Marshall Klein and Jeff Shapiro were asked by NFPA to work on the update of the 2016 edition of the Automatic Sprinkler Systems for Residential Occupancies Handbook. Our assignment was updating

During our review and updating of code references for the Handbook, we discovered that two important words, “in feet,” had been mistakenly deleted from Section 7.4.3.6.5(5), which changed the entire intent of this subsection with respect to the design of Pedestal/Podium Buildings. The error was tracked backwards from the 2015 edition, and it exists in the 2012, 2009 and 2006 editions of NFPA 5000. Neither we nor staff could identify a proposal or comment to the 2006 edition that would have caused this deletion, so it is presumably the result of an improper, unjustified and undocumented editorial change.

Marshall Klein was a member of the NFPA 5000 Task Group on Height & Area in 2001-2002 that drafted the first edition (2003) text of Section 7.4.3.6.5, “Enclosed Parking Structures with Occupancies Above.” The text was deliberately modeled after the requirements of 2000 IBC Section 508.2, “Group S-2 enclosed parking garage with Groups A, B, M or R above,” so that requirements for both model building codes (IBC & NFPA 5000) would be correlated:

2000 IBC Section 508.2(4):
"The maximum building height in feet shall not exceed the limits set forth in Table 503 for the least restrictive type of construction involved."

2003 NFPA 5000, Section 7.4.3.6.5(6):
"The maximum building height in feet shall not exceed the limits set forth in Table 7.4.1 for the least restrictive type of construction involved."

The height and area Tables in both the IBC (Table 503) and NFPA 5000 (Table 7.4.1) limit building height based on 1) Feet above grade plane and 2) Number of stories. However, IBC Section 508.2(4) and NFPA 5000 Section 7.4.3.6.5(6) ONLY limit building height based on feet above grade plane (not by the number of stories). Although that was clear in the original text, the undocumented change that this TIA seeks to reverse deleted the important text “in feet” from Section 7.4.3.6.5(6) as indicated below.

2006 NFPA 5000, Section 7.4.3.6.5(6):
"The maximum building height shall not exceed the limits set forth in Table 7.4.1 for the least restrictive type of construction involved."

Again, neither we nor the staff were able to identify any public proposal or comment during the code development cycle for the 2006 edition of NFPA 5000 that included this change, and it would not have been noticed at the time of publication because there was no vertical rule (change marker) beside this section in the margin of the 2006 edition to designate the revised text (seemingly confirming that the change was apparently regarded as editorial or was an outright mistake made during document processing). Also supporting the position that this change was an error is the fact that Annex D.6.6(5) still retains the “in feet” text.

2015 NFPA 5000, Section D.6.6:
"(5) The maximum building height in feet shall not exceed the limits set forth in Table D.4.2.2.1(a) or Table D.4.2.2.1(b) for the least restrictive type of construction involved."

Since NFPA 5000 is not presently used for this type of construction in the U.S., the change wasn’t noticed until we were reviewing provisions to prepare our portion of the 2016 Automatic Sprinkler Systems for Residential Occupancies Handbook.

This change, seemingly made in error by NFPA editorial staff, could have a major impact on any design under this section of Code from the 2006 through the 2015 editions that has never been justified and which was not made in compliance with due process requirements of NFPA/ANSI.
consensus procedures in the Regulations Governing the Development of NFPA Standards. Based on our discussion with NFPA Staff, it has been recommended that a TIA be issued because of how long the deleted text has existed. In addition, NFPA Staff recommended that we also submit this Public Input to get this editorial mistake resolved.

Submitter Information Verification

Submitter Full Name: MARSHALL KLEIN
Organization: MARSHALL A KLEIN ASSOCIATES
Affiliation: NMHC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 03 17:20:33 EDT 2015

Committee Statement

Resolution:
Statement: The committee agrees with the change but for the main reason that it clarifies the intent of the code.
Public Input No. 11-NFPA 5000-2015 [Section No. 7.5.2]

7.5.2 Residential Sprinkler Increase.

For buildings classified as residential occupancies provided with an approved, electrically supervised automatic sprinkler system in accordance with NFPA 13R, the allowable height for nonsprinklered buildings shall be permitted to be increased by 20 ft (6100 mm), and the allowable number of stories for nonsprinklered buildings shall be permitted to be increased by one story, provided that the building height does not exceed 60 ft (18 m) in height above grade plane, and the number of stories above grade plane does not exceed four.

Statement of Problem and Substantiation for Public Input

Intent of the code proposal is to correlate the revised wording in the 2013 NFPA 13R under its Scope 1.1 with NFPA Codes that reference NFPA 13R.

The 2015 IBC did this correlation under its revision of Section 903.3.1.2.

Correlation of the IBC, NFPA 101 and NFPA 5000 with the scope of NFPA 13R will make the codes user friendly and will not leave room for misinterpretation of the requirements for application of NFPA 13R.

2013 NFPA 13R Section 1.1 now states:

“This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height in buildings not exceeding 60 ft (18 m) in height above grade plane.”

Submitter Information Verification

Submitter Full Name: Marshall Klein
Affiliation: National Multifamily Housing Council (NMHC)
Street Address:
City:
State:
Zip:
Submittal Date: Wed Mar 04 16:47:08 EST 2015

Committee Statement

Resolution:
Statement: Intent of the revision is to correlate the revised wording in the 2013 edition of NFPA 13R under its Scope 1.1 with NFPA Codes that reference NFPA 13R.

Correlation of the NFPA 5000 with the scope of NFPA 13R will make the codes user friendly and will not leave room for misinterpretation of the requirements for application of
NFPA 13R.

2013 NFPA 13R Section 1.1 now states:

"This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height in buildings not exceeding 60 ft (18 m) in height above grade plane."
8.2.2.1.1* Marking and Identification

Fire resistive and smoke rated walls, partitions and floors including fire walls, fire barriers, smoke barriers and smoke partitions shall have permanent markings along the entire length of the assembly to ensure integrity of penetrations. Markings shall be as follows:

1. located in accessible concealed floor, floor ceiling or attic spaces
2. starting within 10 feet from the end of the wall, repeated and spaced a maximum of 20 feet measured horizontally along the wall or partition
3. identified by lettering not less than 3 inch in height stating "RATED BARRIER – SEAL ALL PENETRATIONS"

Statement of Problem and Substantiation for Public Input

Over time, the chances are high of a rated wall being compromised in attic spaces. This is done by contractors, workers and occupants. Marking the rated wall as described will help maintain the integrity of the rating which is important for the life of the building.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 121-NFPA 5000-2015 [New Section after A.8.2.1.1]</td>
<td></td>
</tr>
</tbody>
</table>

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA’s Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 17:02:46 EDT 2015

Committee Statement

Resolution: FR-3501-NFPA 5000-2015
Statement: This proposal supports the concept covered by Public Input 119 and 121 for marking fire and smoke rated walls. It clarifies the following points:

The requirements are placed in the general section in Chapter 8 so they are applicable for fire barriers, smoke barriers, and smoke partitions.

Wall markings are only required for assemblies covered by NFPA 101 and NFPA 5000.
The markings are only required for walls that have accessible concealed spaces, and the markings are to be provided in the concealed spaces.
Public Input No. 123-NFPA 5000-2015 [ New Section after 8.4.3.2 ]

8.4.3.3
Where impact protection is added to a fire-protected covering, the impact protection shall not degrade the fire resistance rating.

Statement of Problem and Substantiation for Public Input

Where a material is added to an otherwise fire-rated assembly as protection against impact damage, that material should not adversely affect the rated assembly's fire-rating. Since 8.4.3 is extracted from NFPA 221, Section 4.6, the committee may consider correlation with NFPA 221 by adding this to NFPA 221.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 17:08:47 EDT 2015

Committee Statement

Resolution: The committee notes that "...shall not degrade the fire resistance rating." is a subjective phrase. This would be difficult to enforce and would need to have some type of quantification to make it an enforceable rule.
Sections 8.7, 8.8, 8.9

8.7 – Opening Protectives.

8.7.1 – Fire Doors and Fire Windows.

Where required doors and windows serve as opening protectives, they shall comply with the requirements of NFPA 80, *Standard for Fire Doors and Other Opening Protectives*.

8.7.2 – Minimum Fire Protection Rating.

Opening protectives shall have a minimum fire protection rating as specified in Table 8.7.2.

Table 8.7.2 Minimum Fire Ratings for Opening Protectives in Fire Resistance–Rated Assemblies and Fire Rated Glazing Markings

<table>
<thead>
<tr>
<th>Component</th>
<th>Walls and Partitions (hr)</th>
<th>Fire Door Assemblies (hr)</th>
<th>Door Vision Panel Maximum Size (in.²)</th>
<th>Fire Rated Glazing Marking Door Vision Panel</th>
<th>Minimum Fire Rated Glazing Marking Side Light/Transom Assembly (hr)</th>
<th>Fire Rated Window Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevator hoistways</td>
<td>2</td>
<td>1</td>
<td>1/2</td>
<td>155 sq. in.</td>
<td>D-H-90 or D-H-W-90</td>
<td>NP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical shafts (including stairways, exits and refuse chutes)</td>
<td>2</td>
<td>1</td>
<td>1/2</td>
<td>100 sq. in.</td>
<td>D-H-90 or D-H-W-90</td>
<td>NP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exit access corridors</td>
<td>1</td>
<td>1/2</td>
<td></td>
<td>100 sq. in.</td>
<td>D-H-90 or D-H-W-90</td>
<td>NP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke barriers</td>
<td>a</td>
<td>1/2</td>
<td></td>
<td>100 sq. in.</td>
<td>D-H-90 or D-H-W-90</td>
<td>NP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke partitions</td>
<td>a,b</td>
<td>1/3</td>
<td></td>
<td>100 sq. in.</td>
<td>D-H-90 or D-H-W-90</td>
<td>NP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NP: Not permitted.

a Fire doors are not required to have a hose stream test per NFPA 252, *Standard Methods of National Fire Protection Association Report*.

b. For residential board and care, see 32.2.3.1 and 33.2.3.1.

c. Fire resistance rated glazing tested to NFPA 251 shall be permitted in the maximum size tested (see 8.3.3.7).

d. Maximum area of individual exposed lights shall be 1296 in.\(^2\) (0.84 m\(^2\)) with no dimension exceeding 54 in. (1.37 m) unless otherwise tested. [80: Table 4.4.5 Note b and 80: 4.4.5.1].

e. Fire-rated glazing in exterior windows shall be marked in accordance with Table 8.3.3.12.

f. See ASME A17.1, Safety Code for Elevators and Escalators, for additional information.

g. See ASME A17.3, Safety Code for Existing Elevators and Escalators, for additional information.

h. Note: 1 in.\(^2\) = 0.00064516 m\(^2\).

8.7.3

Fire-rated glazing assemblies marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements.

Fire-rated glazing assemblies marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements.

Fire-rated glazing assemblies marked with ratings (XXX) that exceed the ratings required by this Code shall be permitted.

8.7.4

Fire Door Closers.

8.7.4.1

Unless otherwise specified, fire doors shall be self-closing or automatic-closing.

8.7.4.2

Fire doors used to protect the means of egress shall be self-closing or automatic-closing in accordance with 11.2.1.8.1.

8.7.5

Initiating Devices.

Detection devices activating the closer shall conform to NFPA 72, National Fire Alarm and Signaling Code.®

8.7.6

Fire Door Assemblies and Fire Window Assemblies.

8.7.6.1

Openings required to have a fire protection rating by Table 8.7.2 shall be protected by approved, listed, and labeled fire door assemblies and fire window assemblies and their accompanying hardware, including all frames, closing devices, anchorage, and sills in accordance with the requirements of NFPA 80, Standard for Fire Doors and Other Opening Protectives, except as otherwise specified in this Code.

8.7.6.2

Fire protection ratings for products intended to comply with 8.7.6 shall be as determined and reported by a nationally recognized testing agency in accordance with NFPA 252, Standard Methods of Fire Tests of Door Assemblies, or NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies.

8.7.6.2.1

NFPA 257 shall evaluate fire protection-rated glazing under positive pressure.
8.7.6.2.2

8.7.6.2.3
NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, shall evaluate doors, other than side-hinged or pivoted-swinging doors, with the neutral pressure plane no higher than the top of the door.

8.7.6.2.4
All fire door assemblies and fire window assemblies shall bear an approved label.

8.7.7 Opening Protectives.

8.7.7.1 Opening protectives in fire walls and fire barrier walls shall have a fire protection rating in accordance with Table 8.7.2.

8.7.7.2 Fire door assemblies and fire window assemblies shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Other Opening Protectives*.

8.7.7.3 Fire resistance-rated glazing complying with 8.2.2.4.2 shall be permitted in fire doors and fire window assemblies in accordance with their listings.

8.7.7.4 The maximum size of fire doors shall not exceed that specified in NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, except as modified by Chapter 11.

8.7.8 Floor Fire Door Assemblies.

8.7.8.1 Floor fire door assemblies used to protect openings in fire resistance-rated floors shall be tested in the horizontal position in accordance with NFPA 288, *Standard Methods of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistance-Rated Floor Systems*, and shall achieve a fire resistance rating not less than the assembly being penetrated.

8.7.8.2 Floor fire door assemblies shall be approved, listed, and labeled.

8.7.9 Use of Wired Glass.

8.7.9.1 Wired glass that is 4/4 in. (6.3 mm) thick and labeled for fire protection purposes shall be permitted to be used in approved opening protectives, with the maximum sizes in accordance with their listing.

8.7.9.2 Other glazing materials that have been tested and labeled to indicate the type of opening to be protected for fire protection purposes shall be permitted to be used in approved opening protectives in accordance with their listing and with the maximum sizes tested.
8.7.10 Fire Window Assemblies.

Fire window assemblies shall be permitted in fire barriers having a required fire resistance rating of 1 hour or less and shall be of an approved type with the appropriate fire protection rating for the location in which they are installed.

8.7.11 Windows in Exterior Walls.

8.7.11.1 Three-quarter-hour fire protection-rated windows in exterior walls shall be permitted to have an area not over 84 ft$^2$ (7.8 m$^2$), with neither the width nor the height exceeding 12 ft (3660 mm).

8.7.11.2 Fire windows shall be either fixed or automatic-closing.

8.7.12 Nonsymmetrical Glazing Systems.

Nonsymmetrical fire protection-rated glazing systems shall be tested with each face exposed to the furnace, and the assigned fire protection rating shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies.

8.7.13 Sidelights and Transoms.

Glazing used in sidelights and transoms adjacent to 20-minute doors in 1-hour corridor fire barriers shall be tested in accordance with 8.7.6 and shall attain a minimum 45-minute fire protection rating, including hose stream.


Fire protection–rated glazing shall be marked in accordance with Table 8.7.2 and Table 8.7.14, and such marking shall be permanently affixed.

Table 8.7.14 Marking Fire-Rated Glazing Assemblies

| Fire Test Standard Marking Definition of Marking ASTM E-119 or ANSI/UL 263 | W | Meets wall assembly criteria NFPA 257 or ANSI/UL 9 OH Meets fire window assembly criteria, including the hose stream test NFPA 252 or UL 10B or ANSI/UL 10C | D | Meets fire door assembly criteria | H | Meets fire door assembly hose stream test | T | Meets to 450°F (232°C) temperature rise criteria for 30 minutes | XXX | The time, in minutes, of the fire resistance or fire protection rating of the glazing assembly |

8.8 Penetrations.

8.8.1 General.

The provisions of Section 8.8 shall govern the materials and methods of construction used to protect through-penetrations and membrane penetrations in fire walls, fire barrier walls, and fire resistance-rated horizontal assemblies.

8.8.2 Firestop Systems and Devices Required.

Penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a fire barrier shall be protected by a firestop system or device.

8.8.2.1 Testing.

The firestop system or device shall be tested in accordance with ASTM E 814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops, or UL 1479, Standard for Safety for Fire Tests of Through-Penetration Fire Stops, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) between the exposed and the unexposed surface of the test assembly.
8.8.2.2 - Alternative Requirements.

8.8.2.2.1 -

The requirements of 8.8.2 shall not apply where otherwise permitted by any one of the following:


(2) Where penetrations through floors are enclosed in a shaft enclosure designed as a fire barrier

(3) Where concrete, grout, or mortar has been used to fill the annular spaces around cast-iron, copper, or steel piping, or steel conduit or tubing, that penetrates one or more concrete or masonry fire resistance–rated assemblies, and the following also apply:

(4) The nominal diameter of each penetrating item shall not exceed 6 in. (150 mm)

(5) The opening size shall not exceed 144 in.$^2$ (92,909 mm$^2$)

(6) Thickness of the concrete, grout, or mortar shall be the full thickness of the assembly.

(7) Where firestopping materials are used with the following penetrating items, the penetration is limited to one floor, and the firestopping material is capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the time–temperature fire conditions of UL 263, *Fire Tests of Building Construction and Materials*, and/or ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) at the location of the penetration for the time period equivalent to the required fire resistance rating of the assembly penetrated:

(8) Steel, ferrous, or copper cables

(9) Cable or wire with steel jackets

(10) Cast-iron, steel, or copper pipes

(11) Steel conduit or tubing

8.8.2.2.2 -

The maximum nominal diameter of the penetrating item, as indicated in 8.8.2.2.1 (4)(a) through (d), shall not be greater than 4 in. (100 mm) and shall not exceed an aggregate 100 in.$^2$ (64,520 mm$^2$) opening in any 100 ft$^2$ (9.3 m$^2$) of floor or wall area.

8.8.2.3 - F Ratings.

Firestop systems and devices shall have an F rating of at least 1 hour, but not less than the required fire resistance rating of the fire barrier penetrated.
8.8.2.4 – T Ratings.

Penetrations in fire resistance–rated horizontal assemblies shall be required to have a T rating of at least 1 hour, but not less than the fire resistance rating of the horizontal assembly, and shall not be required for either of the following:

1. A T rating is not required for floor penetrations contained within the cavity of a wall assembly.

2. A T rating is not required for penetrations through floors or floor assemblies where the penetration is not in direct contact with combustible material.

8.8.3 – Use of Sleeves for Penetration.

Where the penetrating item uses a sleeve to penetrate the wall or floor, the sleeve shall be securely set in the wall or floor, and the space between the item and the sleeve shall be filled with a material that complies with 8.8.2.

8.8.4 – Insulation Coverings.

Insulation and coverings for penetrating items shall not pass through the wall or floor unless the insulation or covering has been tested as part of the firestop system or device.

8.8.5 – Vibration Isolation.

Where designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:

1. It shall be made on either side of the wall or floor.

2. It shall be designed for the specific purpose.

8.8.6 – Transitions.

8.8.6.1 –

Where piping penetrates a fire resistance–rated wall or floor assembly, combustible piping shall not connect to noncombustible piping within 36 in. (915 mm) of the firestop system or device, unless it can be demonstrated that the transition will not reduce the fire resistance rating.

8.8.6.2 –

Unshielded couplings shall not be used to connect noncombustible piping to combustible piping, unless it can be demonstrated that the transition complies with the fire-resistive protection requirements of 8.8.2.

8.8.7 – Membrane Penetrations.

Membrane penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents, exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a membrane of a wall, floor, or floor/ceiling assembly constructed as a fire barrier shall be protected by a firestop system or device and shall comply with 8.8.2 through 8.8.6.2.
8.8.7.1 –

The firestop system or device shall be tested in accordance with ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, or UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) between the exposed and the unexposed surface of the test assembly, unless one of the following criteria is met:

1. Membrane penetrations of ceilings where the ceiling is not an integral part of a fire resistance-rated floor/ceiling or roof/ceiling assembly
2. Membrane penetrations of steel, ferrous, or copper conduit, piping or tubing, and steel electrical outlet boxes and wires, or combustion vents or exhaust vents where the annular space is protected with an approved material and the aggregate area of the openings does not exceed 100 in.² (64,520 mm²) in any 100 ft² (9.3 m²) of ceiling area
3. Membrane penetrations for electrical outlet boxes and fittings, provided that such devices are listed for use in fire resistance-rated assemblies and are installed in accordance with their listing
4. Annular space created by the membrane penetration of a fire sprinkler, provided that the space is covered by a metal escutcheon plate

8.8.7.2 –

Where walls or partitions are required to have a fire resistance rating of not less than 1 hour, recessed fixtures shall be installed in the wall or partition in such a manner that the required fire resistance is not reduced, unless one of the following criteria is met:

1. Any steel electrical box not exceeding 16 in.² (10,300 mm²) in area shall be permitted where the aggregate area of the openings provided for the boxes does not exceed 100 in.² (64,520 mm²) in any 100 ft² (9.3 m²) of wall area, and, where outlet boxes are installed on opposite sides of the wall, the boxes shall be separated by one of the following means:
   2. By a horizontal distance of not less than 24 in. (610 mm)
   3. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rock wool, or slag wool insulation
   4. By solid fireblocking in accordance with 8.14.2
   5. By other listed materials and methods

6. Membrane penetrations for any listed electrical outlet box made of any material shall be permitted, provided that such boxes have been tested for use in fire resistance-rated assemblies and are installed in accordance with the instructions included in the listing.
7. The annular space created by the membrane penetration of a fire sprinkler shall be permitted, provided that the space is covered by a metal escutcheon plate.
8. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of a wall opening protective material system for use in fire resistance-rated assemblies and are installed in accordance with the instructions included in the listing, shall be permitted.

8.8.8 – Ducts and Air-Transfer Openings.
8.8.8.1 - General.
The provisions of 8.8.8 shall govern the materials and methods of construction used to protect ducts and air-transfer openings in fire walls, fire resistance-rated horizontal assemblies, and fire barrier walls.

8.8.8.2 - Fire Damper Requirements.
Fire dampers shall be installed to protect ducts and air-transfer openings that penetrate fire barriers and fire walls as required by other sections of this Code.

8.8.8.2.1 Fire dampers shall be designed and tested in accordance with the requirements of UL 555, Standard for Fire Dampers, and shall have the minimum fire protection rating specified in Table 8.8.8.2.1 for the rating of the assembly penetrated.

Table 8.8.8.2.1 Fire Damper Rating

<table>
<thead>
<tr>
<th>Fire Resistance Rating of Assembly</th>
<th>Minimum Damper Rating (hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-hr or greater fire resistance-rated assemblies</td>
<td>3</td>
</tr>
<tr>
<td>Less than 3-hr fire resistance-rated assemblies</td>
<td>1 1⁄2</td>
</tr>
<tr>
<td>Ceiling of floor/ceiling or roof/ceiling assemblies</td>
<td>See 8.8.8.6.</td>
</tr>
</tbody>
</table>

8.8.8.2.2 In systems where fans continue to operate in the emergency mode, dynamic fire dampers shall be required.

8.8.8.2.3 Fire dampers shall be required in the following locations:

1. Ducts and air-transfer openings penetrating walls or partitions having a fire resistance rating of 2 or more hours.
2. Ducts and air-transfer openings penetrating shaft walls having a fire resistance rating of 1 or more hours.
3. Ducts and air-transfer openings penetrating floors that are required to have protected openings where the duct also is not protected by a shaft enclosure.
4. Air-transfer openings that occur in walls or partitions that are required to have a fire-resistive rating of 30 minutes or more.

8.8.8.2.4 Fire dampers shall not be required in the following locations:

1. In floors that do not require protected floor openings.
2. In a duct system serving only one floor and used only for exhaust of air to the outside and not penetrating a wall or partition having a required fire resistance rating of 2 hours or more or passing entirely through the system and contained within its own dedicated shaft.
3. Where branch ducts connect to enclosed exhaust risers in which the airflow is upward, and steel subducts at least 22 in. (560 mm) in length are carried up inside the riser at each inlet.

8.8.8.3 - Installation.
8.8.8.3.1
Air-conditioning, heating, and ventilating ductwork and related equipment, including fire dampers, smoke dampers, combination fire and smoke dampers, and ceiling radiation dampers, shall be installed in accordance with NFPA 90A, `Standard for the Installation of Air-Conditioning and Ventilating Systems`, or NFPA 90B, `Standard for the Installation of Warm Air Heating and Air-Conditioning Systems`, as specified in Chapter 50, where applicable.

8.8.8.3.2
The equipment specified in 8.8.8.3.1 shall be installed in accordance with the requirements of 8.8.8, the manufacturer's installation instructions, its listing, and the mechanical code as specified in Chapter 50.

8.8.8.4 – Access and Identification.

8.8.8.4.1 – Access.
Fire and smoke dampers shall be provided with an approved means of access, as follows:

(1) The means of access shall be large enough to allow inspection and maintenance of the damper and its operating parts.

(2) The access shall not affect the integrity of fire resistance–rated assemblies.

(3) The access openings shall not reduce the fire resistance rating of the assembly.

(4) Access doors in ducts shall be tight-fitting and suitable for the required duct construction.

(5) Access and maintenance shall comply with the requirements of the mechanical code.

8.8.8.4.2 – Identification.
Access points to fire and smoke dampers shall be permanently identified by one of the following:

(1) Label having letters not less than $\frac{3}{4}$ in. (13 mm) in height reading as follows in 8.8.8.4.2 (a), (b), or (c):

(2) FIRE/SMOKE DAMPER

(3) SMOKE DAMPER

(4) FIRE DAMPER

(5) Symbols as approved by the authority having jurisdiction

8.8.8.5 – Fire Damper Actuation Device.
The operating temperature of the heat-actuating device shall be approximately 50°F (27.8°C) above the normal temperature within the duct system, but not less than 160°F (71°C); or it shall be not more than 286°F (141°C) where located in a required smoke control system; or, where a combination fire and smoke damper is installed, it shall not exceed 350°F (177°C) where located in a smoke control system.

8.8.8.6 – Ceiling Radiation Damper Requirements.
8.8.6.1
Ceiling radiation dampers or other methods of protecting openings in fire resistance–rated floor/ceiling or roof/ceiling assemblies shall comply with the construction details of the tested floor/ceiling or roof/ceiling assembly or with listed ceiling air diffusers or listed ceiling radiation dampers.

8.8.6.2
Ceiling dampers shall be tested in accordance with UL 555C, Standard for Ceiling Dampers.

8.8.6.3
Ceiling radiation dampers shall not be required where either of the following apply:

1. ASTM E 119 fire tests have shown that ceiling radiation dampers are not necessary in order to maintain the fire resistance rating of the assembly.

2. Exhaust duct penetrations are protected in accordance with 8.8.7, and the exhaust ducts are located within the cavity of a wall and do not pass through another dwelling unit or tenant space.

8.9 * - Joints
8.9.1 General
The provisions of Section 8.9 shall govern the materials and methods of construction used to protect joints within or between fire walls, fire barrier walls, floors, and floor/ceiling and roof/ceiling assemblies in accordance with 8.9.2, and at the intersection of the exterior wall and the perimeter of the floor assembly in accordance with 8.9.3.

8.9.2 Joint System Required
8.9.2.1 Joints made within or between fire resistance–rated assemblies shall be protected with a joint system that is designed and tested to prevent the spread of fire for a time period equal to that of the assembly in which the joint is located.

8.9.2.2 The materials, systems, or devices specified in 8.9.2.1 shall be tested as part of the assembly in accordance with the requirements of ASTM E 1966, Standard Test Method for Fire-Resistive Joint Systems, or ANSI/UL 2079, Standard for Tests for Fire Resistance of Building Joint Systems.

8.9.2.2.1 Testing of the joint system shall be representative of the actual installation.

8.9.2.2.2 All joint systems shall be tested at their maximum joint width in accordance with the requirements of ASTM E 1966 or ANSI/UL 2079 under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) for a time period equal to that of the assembly.

8.9.2.2.3 All test specimens shall comply with the minimum height or length required by the standard.


8.9.3 Exterior-Curtain Walls and the Perimeter Joint
8.9.3.1 -
The provisions of 8.9.3 shall be intended to restrict the interior vertical passage of flame and hot gases from one floor to another at the location where the floor intersects the inside of an exterior curtain wall assembly.

8.9.3.2 -
Floor assemblies that are required to be a fire barrier shall extend to, and be tight against, the exterior curtain wall.

8.9.3.3 -
Where fire resistance–rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor or floor/ceiling assemblies shall be sealed with approved materials.

8.9.3.3.1 -
The approved materials specified in 8.9.3 shall be securely installed in accordance with the approved system.

8.9.3.3.2 -
The approved materials specified in 8.9.3 shall be capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to the time–temperature fire conditions of UL 263, Fire Tests of Building Construction and Materials, and/or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) for a time period at least equal to the fire resistance rating of the floor assembly, or when tested in accordance with ASTM E 2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-Story Test Apparatus, and having an F rating equal to the fire resistance rating of the floor assembly.

8.9.3.3.3 -
Where the fire resistance rating of the floor assembly is less than the time period determined in accordance with 8.9.3.3.2, the time period shall be permitted to be not less than the fire resistance rating of the floor assembly.

8.9.3.4 -
Height and fire resistance requirements for curtain wall spandrels shall comply with 37.1.4.

Additional Proposed Changes

<table>
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<tr>
<th>File Name</th>
<th>Description</th>
<th>Approved</th>
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<tr>
<td>NFPA_5000_Opening_Protectives_PI_Submittal_2_.docx</td>
<td>This is the proposed language to replace the deleted language in 8.7, 8.8, and 8.9</td>
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Statement of Problem and Substantiation for Public Input

At the end of the 2015 revision cycle a task group was formed to evaluate the requirements for opening protectives. The current requirements for opening protectives are unorganized and not presented in a logical, user friendly format. The goal of the proposed changes is to reorganize the provisions for opening protectives and to make consistent the provisions in both NFPA 101 and NFPA 5000. The proposed changes are intended to be strictly editorial in nature and include reordering and
renumbering requirements for better usability and application of the opening protective provisions.

NEW REPLACEMENT LANGUAGE PROVIDED AS AN ATTACHMENT to this public input
NEW ASSOCIATED ANNEX LANGUAGE PROVIDED AS AN ATTACHMENT to this public input

Submitter Information Verification

Submitter Full Name: CATHERINE STASHAK
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Submittal Date: Thu Jul 02 13:35:13 EDT 2015

Committee Statement

Resolution: FR-3515-NFPA 5000-2015
Statement: ALL: At the end of the 2015 revision cycle a task group was formed to evaluate the requirements for opening protectives. The current requirements for opening protectives are unorganized and not presented in a logical, user friendly format. The goal of the proposed changes is to reorganize the provisions for opening protectives and to make consistent the provisions in both NFPA 101 and NFPA 5000. The proposed changes are intended to be strictly editorial in nature and include reordering and renumbering requirements for better usability and application of the opening protective provisions. Any revisions that were outside of the scope of the task group were discussed by the committee and are substantiated below.

Former section 8.7.6.2.1 was deleted as NFPA 257 requires all fire protection rated glazing shall be evaluated under positive pressure and is addressed by the general reference to NFPA 257.

Section 8.7.3.1: 2015 text has multiple references for fire doors to be compliant with NFPA 80. References to NFPA 80 was combined to require installation, inspection, testing, and maintenance in accordance with NFPA 80 in once section.

Section 8.7.3.4: The pointer to Section 11.2.1.8 was deleted as it is too limiting and implies that the provision may only be applicable to those doors in the means of egress as addressed by 11.2.1.8.1 or buildings with low or ordinary hazard contents.

Section 8.7.3.5: Existing provision referencing NFPA 72 was deleted as it is already addressed by the reference to NFPA 80 noted above.

Section 8.8.3 and 8.9.2.3: To be consistent with other opening protectives, the ‘Testing, Installation, Inspection, and Maintenance’ directives for penetrations and joints need to be specific in the code. New language provides installation and maintenance provisions for penetrations. Language is consistence with opening protectives such as fire doors and glazing providing language that installation, testing and maintenance be in accordance with NFPA 80.

Section 8.9: The current requirements do not clearly explain the purpose for the joint protection in the fire barrier or when a fire barrier is used as a smoke barrier. Revisions...
consolidate the requirements already scattered through the section into an easier to use format.

A.8.7.7.5 is being added for consistency with NFPA 101.
8.7 Opening Protectives.

8.7.1 General. Every opening in a fire barrier shall be protected to limit the spread of fire and restrict the movement of smoke from one side of the fire barrier to the other.

8.7.2 Minimum Fire Protection Rating

8.7.2.1* Fire protection ratings for products intended required to comply with 8.7 shall be as determined and reported by a nationally recognized testing agency in accordance with NFPA 252, Standard Methods of Fire Tests of Door Assemblies, or NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies. NFPA 252, Standard Methods of Fire Tests of Door Assemblies; ANSI/UL 10B, Standard for Fire Tests of Door Assemblies; ANSI/UL 10C, Standard for Positive Pressure Fire Tests of Door Assemblies; NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies; or ANSI/UL 9, Standard for Fire Tests of Window Assemblies.

8.7.2.2 The fire protection rating for opening protectives in fire barriers, fire-rated smoke barriers, and fire-rated smoke partitions shall be in accordance with Table 8.7.2.2.

Table 8.7.2.2 Minimum Fire Ratings for Opening Protectives in Fire Resistance–Rated Assemblies and Fire Rated Glazing Markings

8.7.2.3 Openings required to have a fire protection rating by Table 8.7.2.2 shall be protected by approved, listed, and labeled fire door assemblies and fire window assemblies and their accompanying hardware, including all frames, closing devices, anchorage, and sills in accordance with the requirements of NFPA 80, Standard for Fire Doors and Other Opening Protectives, except as otherwise specified in this Code.

8.7.3 Fire Doors

8.7.3.1 Fire door assemblies shall be installed in accordance with NFPA 80.

8.7.3.2 All fire door assemblies shall bear an approved label.

8.7.3.3 The maximum size of fire doors shall not exceed that specified in NFPA 80 except as modified by Chapter 11.

8.7.3.4* Unless otherwise specified, fire doors shall be self-closing or automatic-closing in accordance with 11.2.1.8.

8.7.3.5 Detection devices activating the closer shall conform to NFPA 72, National Fire Alarm and Signaling Code®.

8.7.4 Floor Fire Door Assemblies.

8.7.4.1 Floor fire door assemblies used to protect openings in fire resistance–rated floors shall be tested in the horizontal position in accordance with NFPA 288, Standard Methods of Fire Tests of Floor Fire
Door Assemblies Installed Horizontally in Fire Resistance–Rated Floor Systems, and shall achieve a fire resistance rating not less than the assembly being penetrated.

8.7.4.2 Floor fire door assemblies shall be approved, listed, and labeled.

8.7.5 Fire Windows

8.7.5.1 Fire window assemblies shall be installed in accordance with NFPA 80.

8.7.5.2 All fire window assemblies shall bear an approved label.

8.7.5.3* Fire window assemblies shall be permitted in fire barriers having a required fire resistance rating of 1 hour or less and shall be of an approved type with the appropriate fire protection rating for the location in which they are installed.

8.7.6 Windows in Exterior Walls.

8.7.6.1 Three-quarter-hour fire protection-rated windows in exterior walls shall be permitted to have an area not over 84 ft² (7.8 m²), with neither the width nor the height exceeding 12 ft (3660 mm).

8.7.6.2 Fire windows shall be either fixed or automatic-closing.

8.7.7 Glazing

8.7.7.1 Glazing materials that have been tested and labeled to indicate the type of opening to be protected for fire protection purposes shall be permitted to be used in approved opening protectives in accordance with their listing and with the maximum sizes tested.

8.7.7.2 Fire-rated glazing assemblies marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements. Fire-rated glazing assemblies marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements. Fire-rated glazing assemblies marked with ratings (XXX) that exceed the ratings required by this Code shall be permitted.

8.7.7.3 Fire protection–rated glazing shall be marked in accordance with Table 8.7.2.2 and Table 8.7.7.2, and such marking shall be permanently affixed.

Table 8.7.7.2 Marking Fire-Rated Glazing Assemblies

8.7.7.4 Fire protection–rated glazing shall be permitted in fire barriers having a required fire resistance rating of 1 hour or less and shall be of an approved type with the appropriate fire protection rating for the location in which the barriers are installed.

8.7.7.5* Glazing in fire window assemblies shall be of a design that has been tested to meet the conditions of acceptance of NFPA 257 or ANSI/UL 9. Fire protection–rated glazing in fire door assemblies shall be of a design that has been tested to meet the conditions of acceptance of NFPA 252; ANSI/UL 10B; or ANSI/UL 10C.
8.7.7.6 Fire resistance–rated glazing complying with 8.2.2.4.2 shall be permitted in fire doors and fire window assemblies in accordance with their listings.

8.7.7.7 Nonsymmetrical fire protection–rated glazing systems shall be tested with each face exposed to the furnace, and the assigned fire protection rating shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257 or ANSI/UL 9.

8.7.7.8 The total combined area of glazing in fire-rated window assemblies and fire-rated door assemblies used in fire barriers shall not exceed 25 percent of the area of the fire barrier that is common with any room.

8.7.8 Sidelights and Transoms. Glazing used in sidelights and transoms adjacent to 20-minute doors in 1-hour corridor fire barriers shall be tested in accordance with 8.7.2, including hose stream, and shall attain a minimum 45-minute fire protection rating.

8.8 Penetrations.

8.8.1 General. The provisions of Section 8.8 shall govern the materials and methods of construction used to protect through-penetrations and membrane penetrations in fire walls, fire barrier walls, and fire resistance–rated horizontal assemblies.

8.8.2* Firestop Systems and Devices Required. Penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a fire barrier shall be protected by a firestop system or device.

8.8.2.1 Testing. The firestop system or device shall be tested in accordance with ASTM E 814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops, or ANSI/UL 1479, Standard for Safety for Fire Tests of Through-Penetration Fire Stops, at a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) between the exposed and the unexposed surface of the test assembly.

8.8.2.2 F Ratings. Firestop systems and devices shall have an F-rating of not less than 1-hour, and not less than the required fire resistance rating of the fire barrier penetrated.

8.8.2.3 T Ratings.

8.8.2.3.1 Penetrations in fire resistance–rated horizontal assemblies shall be required to have a T rating of at least 1 hour, but not less than the fire resistance rating of the horizontal assembly.

8.8.2.3.2 A T rating shall not be required for either of the following:
(1) Floor penetrations contained within the cavity of a wall assembly.
(2) Penetrations through floors or floor assemblies where the penetration is not in direct contact with combustible material.

8.8.2.4 Alternative Firestop Requirements.

8.8.2.4.1 The requirements of 8.8.2 shall not apply where otherwise permitted by any one of the following:
(1) Where penetrations are tested and installed as part of an assembly in accordance with the ANSI/UL 263, Fire Tests of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials, rated assembly

(2) Where penetrations through floors are enclosed in a shaft enclosure designed as a fire barrier

(3) Where concrete, grout, or mortar has been used to fill the annular spaces around cast-iron, copper, or steel piping, conduit, or tubing, that penetrates one or more concrete or masonry fire resistance-rated assemblies, and all of the following shall apply:
   a. The nominal diameter of each penetrating item shall not exceed 6 in. (150 mm)
   b. The opening size shall not exceed 144 in.² (92,909 mm²)
   c. Thickness of the concrete, grout, or mortar shall be the full thickness of the assembly.

(4) Where firestopping materials are used with the following penetrating items, the penetration is limited to one floor, and the firestopping material is capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the time–temperature fire conditions of ANSI/UL 263 or ASTM E 119, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) at the location of the penetration for the time period equivalent to the required fire resistance rating of the assembly penetrated:
   a. Steel, ferrous, or copper cables
   b. Cable or wire with steel jackets
   c. Cast-iron, steel, or copper pipes
   d. Steel conduit or tubing

8.8.2.4.2 The maximum nominal diameter of the penetrating item, as indicated in 8.8.2.4.1(4)(a) through (d), shall not be greater than 4 in. (100 mm) and shall not exceed an aggregate 100 in.² (64,520 mm²) opening in any 100 ft² (9.3 m²) of floor or wall area.

8.8.3 Sleeves. Where the penetrating item uses a sleeve to penetrate the wall or floor, the sleeve shall be securely set in the wall or floor, and the space between the item and the sleeve shall be filled with a material that complies with 8.8.2.

8.8.4 Insulation and Coverings. Insulation and coverings for penetrating items shall not pass through the wall or floor unless the insulation or covering has been tested as part of the firestop system or device

8.8.5 Vibration Isolation. Where designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:
   1. It shall be provided on either side of the wall or floor.
   2. It shall be designed for the specific purpose.

8.8.6 Transitions.

8.8.6.1 Where piping penetrates a fire resistance–rated wall or floor assembly, combustible piping shall not connect to noncombustible piping within 36 in. (915 mm) of the firestop system or device, unless it can be demonstrated that the transition will not reduce the fire resistance rating.

8.8.6.2 Unshielded couplings shall not be used to connect noncombustible piping to combustible piping, unless it can be demonstrated that the transition complies with the fire-resistive protection requirements of 8.8.2.

8.8.7 Membrane Penetrations.
8.8.7.1 Membrane penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents, exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a membrane of a wall, floor, or floor/ceiling assembly constructed as a fire barrier shall be protected by a firestop system or device and shall comply with 8.8.2 through 8.8.6.2.

8.8.7.2 The firestop system or device shall be tested in accordance with ASTM E 814 or ANSI/UL 1479 at a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) between the exposed and the unexposed surface of the test assembly, unless one of the following criteria is met:

(1) Membrane penetrations of ceilings that are not an integral part of a fire resistance–rated floor/ceiling or roof/ceiling assembly
(2) Membrane penetrations of steel, ferrous, or copper conduits, and pipes, tubes, or combustion vents or exhaust vents where the annular space is protected with an approved material and the aggregate area of the openings does not exceed 100 in.2 (64,520 mm2) in any 100 ft2 (9.3 m2) of ceiling area
(3) Electrical outlet boxes and fittings, provided that such devices are listed for use in fire resistance–rated assemblies and are installed in accordance with their listing
(4) The annular space created by the membrane penetration of a fire sprinkler, provided that the space is covered by a metal escutcheon plate

8.8.7.3 Where walls or partitions are required to have a minimum 1 hour fire resistance rating, recessed fixtures shall be installed in the wall or partition in such a manner that the required fire resistance is not reduced, unless one of the following criteria is met:

(1) Any steel electrical box not exceeding 16 in.2 (10,300 mm2) in area shall be permitted where the aggregate area of the openings provided for the boxes does not exceed 100 in.2 (64,520 mm2) in any 100 ft2 (9.3 m2) of wall area, and, where outlet boxes are installed on opposite sides of the wall, the boxes shall be separated by one of the following means:
   (a) Horizontal distance of not less than 24 in. (610 mm)
   (b) Horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rock wool, or slag wool insulation
   (c) Solid fireblocking in accordance with 8.14.2
   (d) Other listed materials and methods
(2) Membrane penetrations for any listed electrical outlet box made of any material shall be permitted, provided that such boxes have been tested for use in fire resistance–rated assemblies and are installed in accordance with the instructions included in the listing.
(3) The annular space created by the membrane penetration of a fire sprinkler shall be permitted, provided that the space is covered by a metal escutcheon plate.
(4) Membrane penetrations by electrical boxes of any size or type, which have been listed as part of a wall opening protective material system for use in fire resistance–rated assemblies and are installed in accordance with the instructions included in the listing, shall be permitted.

8.8.8 Ducts and Air-Transfer Openings.

8.8.8.1 General. The provisions of 8.8.8 shall govern the materials and methods of construction used to protect ducts and air-transfer openings in fire walls, fire resistance–rated horizontal assemblies, and fire barrier walls.
8.8.8.2* Fire Damper Installation Requirements. Fire dampers shall be installed to protect ducts and air-transfer openings that penetrate fire barriers and fire walls as required by other sections of this Code.

8.8.8.2.1
Fire dampers shall be designed and tested in accordance with the requirements of UL 555, *Standard for Fire Dampers*, and shall have the minimum fire protection rating specified in Table 8.8.8.2.1 for the rating of the assembly penetrated.

*Table 8.8.8.2.1 Fire Damper Rating*

8.8.8.2.2 In systems where fans continue to operate in the emergency mode, dynamic fire dampers shall be required.

8.8.8.2.3 Fire dampers shall be required in the following locations:
(1) Ducts and air-transfer openings penetrating walls or partitions having a fire resistance rating of 2 or more hours
(2) Ducts and air-transfer openings penetrating shaft walls having a fire resistance rating of 1 or more hours
(3) Ducts and air-transfer openings penetrating floors that are required to have protected openings where the duct also is not protected by a shaft enclosure
(4) Air-transfer openings that occur in walls or partitions that are required to have a fire-resistive rating of 30 minutes or more

8.8.8.2.4 Fire dampers shall not be required in the following locations:
(1) In floors that do not require protected floor openings
(2) In a duct system serving only one floor and used only for exhaust of air to the outside and not penetrating a wall or partition having a required fire resistance rating of 2 hours or more or passing entirely through the system and contained within its own dedicated shaft
(3) Where branch ducts connect to enclosed exhaust risers in which the airflow is upward, and steel subducts at least 22 in. (560 mm) in length are carried up inside the riser at each inlet

8.8.8.3 Installation.

8.8.8.3.1 Air-conditioning, heating, and ventilating ductwork and related equipment, including fire dampers, smoke dampers, combination fire and smoke dampers, and ceiling radiation dampers, shall be installed in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, or NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, as specified in Chapter 50, where applicable.

8.8.8.3.2 The equipment specified in 8.8.8.3.1 shall be installed in accordance with the requirements of 8.8.8, the manufacturer's installation instructions, its listing, and the mechanical code as specified in Chapter 50.

8.8.8.4 Access and Identification.
8.8.8.4.1 Access Fire and smoke dampers shall be provided with an approved means of access, as follows:
(1) The means of access shall be large enough to allow inspection and maintenance of the damper and its operating parts.
(2) The access shall not affect the integrity of fire resistance–rated assemblies.
(3) The access openings shall not reduce the fire resistance rating of the assembly.
(4) Access doors in ducts shall be tight-fitting and suitable for the required duct construction.
(5) Access and maintenance shall comply with the requirements of the mechanical code.

8.8.8.4.2 Identification. Access points to fire and smoke dampers shall be permanently identified by one of the following:
(1) Label having letters not less than 1/2 in. (13 mm) in height reading as follows in 8.8.8.4.2(a), (b), or (c):
   (a) FIRE/SMOKE DAMPER
   (b) SMOKE DAMPER
   (c) FIRE DAMPER
(2) Symbols as approved by the authority having jurisdiction

8.8.8.5* Fire Damper Actuation Device. The operating temperature of the heat-actuating device shall be approximately 50°F (27.8°C) above the normal temperature within the duct system, but not less than 160°F (71°C); or it shall be not more than 286°F (141°C) where located in a required smoke control system; or, where a combination fire and smoke damper is installed, it shall not exceed 350°F (177°C) where located in a smoke control system.

8.8.8.6 Ceiling Radiation Damper Requirements.

8.8.8.6.1 Ceiling radiation dampers or other methods of protecting openings in fire resistance–rated floor/ceiling or roof/ceiling assemblies shall comply with the construction details of the tested floor/ceiling or roof/ceiling assembly or with listed ceiling air diffusers or listed ceiling radiation dampers.

8.8.8.6.2 Ceiling dampers shall be tested in accordance with UL 555C, Standard for Ceiling Dampers.

8.8.8.6.3 Ceiling radiation dampers shall not be required where either of the following apply:
(1) ANSI/UL 263 or ASTM E 119 fire tests have shown that ceiling radiation dampers are not necessary in order to maintain the fire resistance rating of the assembly.
(2) Exhaust duct penetrations are protected in accordance with 8.8.7, and the exhaust ducts are located within the cavity of a wall and do not pass through another dwelling unit or tenant space.

8.9* Joints.

8.9.1 General. The provisions of Section 8.9 shall govern the materials and methods of construction used to protect joints within or between fire walls, fire barrier walls, floors, and floor/ceiling and roof/ceiling assemblies in accordance with 8.9.2, and at the intersection of the exterior wall and the perimeter of the floor assembly in accordance with 8.9.3.
8.9.2 Joint System Requirements. Testing of the joint system shall be representative of the actual installation suitable for the required engineering demand without compromising the fire resistance rating of the assembly or the structural integrity of the assembly.

8.9.2.1* Joints made within or between fire resistance-rated assemblies shall be protected with a joint system that is designed and tested to prevent the spread of fire for a time period equal to that of the assembly in which the joint is located.

8.9.2.2 The materials, systems, or devices specified in 8.9.2.1 shall be tested as part of the assembly in accordance with the requirements of ASTM E 1966, Standard Test Method for Fire-Resistive Joint Systems, or ANSI/UL 2079, Standard for Tests for Fire Resistance of Building Joint Systems.

8.9.2.3 All joint systems shall be tested at their maximum joint width in accordance with the requirements of ASTM E 1966 or ANSI/UL 2079 under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) for a time period equal to that of the assembly.

8.9.2.4 All test specimens shall comply with the minimum height or length required by the standard.

8.9.2.5 Wall assemblies shall be subjected to a hose stream test in accordance with ASTM E 119 or ANSI/UL 263.

8.9.3 Exterior Curtain Walls and the Perimeter Joint.

8.9.3.1* The provisions of 8.9.3 shall be intended to restrict the interior vertical passage of flame and hot gases from one floor to another at the location where the floor intersects the inside of an exterior curtain wall assembly.

8.9.3.2 Floor assemblies that are required to be a fire barrier shall extend to, and be tight against, the exterior curtain wall.

8.9.3.3 Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor or floor/ceiling assemblies shall be sealed with approved materials.

8.9.3.3.1 The approved materials specified in 8.9.3.3 shall be securely installed in accordance with the approved system.

8.9.3.3.2 The approved materials specified in 8.9.3.3 shall be capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to the time–temperature fire conditions of ANSI/UL 263 or ASTM E 119, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) for a time period at least equal to the fire resistance rating of the floor assembly, or when tested in accordance with ASTM E 2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-Story Test Apparatus, and having an F rating equal to the fire resistance rating of the floor assembly.
8.9.3.3 Where the fire resistance rating of the floor assembly is less than the time period determined in accordance with 8.9.3.3.2, the time period shall be permitted to be not less than the fire resistance rating of the floor assembly.

8.9.3.4 Height and fire resistance requirements for curtain wall spandrels shall comply with 37.1.4.
A.8.7.2.1
Some doors and glazing assemblies have been tested to meet the conditions of acceptance of ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Standard for Fire Tests of Building Construction and Materials. Where such assemblies are used, the provisions of Section 8.3 or Section 8.4 should be applied instead of those of 8.7.6.2. NFPA 252, Standard Methods of Fire Tests of Door Assemblies, and UL 10C, Standard for Positive-Pressure Fire Tests of Door Assemblies, are considered nationally recognized methods of determining fire protection ratings and have been found to yield equivalent test methods for side-hinged or pivoted-swinging doors. NFPA 252, Standard Methods of Fire Tests of Door Assemblies, and UL 10B, Standard for Fire Tests of Door Assemblies, are considered nationally recognized methods of determining fire protection ratings and have been found to yield equivalent test results for other types of doors.

A.8.7.3.4
Any door that is required to be self-closing or automatic-closing by NFPA 101, Life Safety Code, cannot be held open with a fusible link or similar device. It is recognized that this Code requires some doors to be self-closing or automatic-closing where fusible link devices might be acceptable, such as for area separations or for separation of building construction types. Paragraph 8.7.4.1 allows doors to be self-closing or automatic-closing by any device, including fusible links, acceptable to NFPA 80, Standard for Fire Doors and Other Opening Protectives. However, 8.7.4.2 clarifies that doors typically required by NFPA 101 to be self-closing or automatic-closing can be held open only if released by smoke detection as outlined in 11.2.1.8.2. This requirement would typically apply to doors in exit enclosures, horizontal exits, vertical opening enclosures, smoke barriers, occupancy separations, and most hazardous area enclosures and corridor walls required to be fire rated or to resist the passage of smoke, unless exempted by the appropriate occupancy chapter.

A.8.7.5.3
Some doors and glazing assemblies have been tested to meet the conditions of acceptance of ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Standard for Fire Tests of Building Construction and Materials. Where such assemblies are used, the provisions of Section 8.3 or Section 8.4 should be applied instead of those of 8.7.6.2.

A.8.7.7.5
Some window assemblies have been tested to meet the conditions of acceptance of ASTM E 119 or ANSI/UL 263. Where such assemblies are used, the provisions of Section 8.3 or Section 8.4 should be applied instead of those of 8.7.6.2.

A.8.8.2
Firestop materials become systems when installed to the listed firestop system design from an accredited testing laboratory. Installation of firestop materials to the listed system should meet all limitations of the system.

There are management system–based contractor approval or qualification programs offered by third-party, independent companies that quantifiably qualify a company to install firestop materials that become systems after proper installation. In each program, there is an industry firestop exam that gives the company a basis to appoint a “Designated Responsible Individual.”

Then, the third-party firm audits the firestop company’s product and systems documentation records in conjunction with the company’s management system operational policies and procedures to verify company compliance. An audit also takes place on a project site to verify that the management system is working.
Where the configuration of a penetrating item or group of items is such that a listed system is determined to be nonexistent and reconfiguration of the penetrations or fire resistance-rated assembly is determined to be impractical or impossible, alternative methods for maintaining the integrity of the required fire resistance rating of the assembly should be permitted to be established using an engineering analysis based on a comparison of listed systems prepared by a manufacturer’s technical representative of the systems specified, by the laboratory that conducted the original test, or by a professional engineer.


Independent inspection paid for by the owner is in many specifications and referenced in this Annex using ASTM E 2174 and ASTM E 2393, *Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*. As a result, there is an accreditation program available for firestop special inspection agencies.

A.8.8.2.4.1(1)

Penetrations of fire barriers or smoke barriers required to have a fire resistance rating (wall, floor, and floor/ceiling and roof/ceiling assemblies) should be contained or should be tested for a period of time not less than the fire resistance rating of the assembly penetrated under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) in accordance with one of the following:

1. Tested in accordance with ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*
3. Tested in accordance with ANSI/UL 1479, *Standard for Fire Tests of Through-Penetration Fire Stops*
4. Contained in a fire resistance-rated shaft enclosure

The suitability of a specific type of firestop system for the assembly penetrated should be determined in accordance with the construction conditions, the manufacturer's installation requirements, and its listing.

ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, defines hourly ratings for firestop systems, which are explained in the following paragraphs.

The F rating criterion prohibits flame-through and requires an acceptable hose stream performance. An F rating equal to the assembly penetrated should be required in order to limit the spread of fire.

The T rating criterion measures the temperature rise on the unexposed surface of the wall or floor assembly, on the penetrating item, and on the firestop material; it also requires an acceptable hose stream performance. Where penetrating items through floors are located outside a wall cavity, the temperature (or T rating) of the firestop system should not exceed 325°F (181°C) above ambient where the penetrating item will come into contact with combustible materials.

The L rating criterion (as established in UL 1479) determines the amount of air leakage in cubic feet per minute per square foot (cubic meters per minute per square meter) of opening through the firestop system at ambient temperature and at 400°F (204°C) at an air pressure differential of 0.30 in. water column (75 Pa). The L rating provides information regarding the suitability of the firestop system for use in a smoke barrier or smoke partition where such assemblies are used to
limit the migration of smoke as required by other sections of this Code. Although no specific acceptability requirements are established by any standard, such air leakage (smoke) limitations might be established by the designer or other sections of this Code.

Where this Code permits the use of concrete, mortar, or grout as a firestop material for dynamic piping systems that expand and contract, provisions might be needed to protect the piping from corrosion or chafing.

Pipes and tubes carrying hazardous materials might require additional protection.

NFPA 70, National Electrical Code, contains requirements for installation and percentage of electrical conductor fill for conduit, cable trays, and other electrical conductor raceways, which also affect the requirements for each type of electrical penetration and the suitability of the firestop system. The 1-hour T rating might not be suitable in electrical through-penetrations such as bus bars, bus ducts, or cable trays where the effect of ampacity reduction has not been investigated.

A.8.8.8.2
In engineered smoke management systems, the designer should consider the use of high-temperature links on fire dampers where air-handling ducts penetrate fire barriers.

A.8.8.8.5
For smoke control systems, see NFPA 92, Standard for Smoke Control Systems.

A.8.9
Expansion joints are usually found only in buildings that are at least 200 ft (61 m) in length or width, or both, and that are of steel or concrete construction. They are provided to permit the separate portions of the structural frame to expand and contract with temperature and moisture changes without adversely affecting the building's structural integrity or serviceability. Expansion joints can usually be identified by the following characteristics:

(1) Double row of columns

(2) Width of 1 in. to 3 in. (25 mm to 75 mm)

Seismic joints might be found in buildings other than those that are rectangular in plan (e.g., L- and T-shaped buildings) in areas where the risk of an earthquake is moderate to high. Such joints in multistory buildings can be as much as 12 in. (305 mm) in width. They are provided to allow the separate portions of the building to act independently of each other to undergo differential lateral displacement when an earthquake occurs.

With expansion or seismic joints, consideration should be given to the ability of the protecting system to remain in place and perform its intended function after repeated movements of the joints, and with the width of the joint varying from its maximum to minimum width. In the case of seismic joints, the protection system might be damaged during an earthquake that otherwise is not strong enough to cause major structural damage to the building. Therefore, it is necessary to conduct an inspection of those joints after an earthquake.

Methods of protecting expansion or seismic joints include the use of a steel plate cover that is attached to the floor on the side of the joint and is free to slide on the other side, or an elastomeric sealant tested for fire resistivity and expansion/contraction capability. Two methods of determining the fire resistance rating of expansion and seismic joints include testing in accordance with UL 2079, Standard for Test for Fire Resistance of Building Joint Systems, or ASTM E 1966, Standard Test Method for Fire Resistive Joint Systems.

Expansion joints and seismic joints should not be confused with control or construction joints. Control joints are normally found in concrete or masonry wall and concrete slabs-on-ground. They are provided to (1) prevent cracking of the wall or slab due to excessive tensile forces in the
concrete or masonry caused by shrinkage upon drying, or (2) induce cracking caused by drying shrinkage at a predetermined location; hence, the term control joint.

Construction joints are used as stopping and starting points for two successive concrete placement (pours) in walls, floors, and beams. Since a construction joint must be designed to transfer load across the joints, separation due to thermal- or moisture-induced movements is not anticipated.

Two other types of linear openings occur in fire barriers at (1) the intersection at the top of a wall and the underside of the floor or roof above (i.e., head of wall), and at (2) the intersection at the perimeter of a floor of a fire-rated or non-fire-rated exterior wall assembly. Both of these lineal openings might be several inches wide and can be subject to movement induced by thermal expansion, wind loads, and live and dead loads. Appropriate protection is critical to the fire-resistant integrity and continuity of the floor or wall assembly. A fire resistance-rated perimeter joint system designed and tested for these locations should be securely installed in or on the intersection for its entire length, so as not to dislodge, loosen, or otherwise impair its ability to accommodate expected building movements.

A.8.9.2.1

Materials used to protect joints become systems when installed to the listed joint system design from an accredited testing laboratory. Installation of joint materials to the listed system should meet all limitations of the system.

There are management system–based contractor approval or qualification programs offered by third-party, independent companies that quantifiably qualify a company to install firestop materials that become systems after proper installation. In each program, there is an industry firestop exam that gives the company a basis to appoint a “Designated Responsible Individual.”

Then, the third-party firm audits the firestop company’s product and systems documentation records in conjunction with the company’s management system operational policies and procedures to verify company compliance. An audit also takes place on a project site to verify that the management system is working.

Where the configuration of a joint is such that a listed system is determined to be nonexistent and reconfiguration of the joint or fire resistance–rated assembly is determined to be impractical or impossible, alternative methods for maintaining the integrity of the required fire resistance rating of the assembly should be permitted to be established using an engineering analysis based on a comparison of listed systems by a manufacturer’s technical representative of the systems specified, prepared by the laboratory that conducted the original test, or by a professional engineer.

On-site inspection of firestopping is important in maintaining the integrity of any vertical or horizontal fire barrier. Two standard practice documents were developed with the ASTM process to allow inspections of through-penetration firestops, joints, and perimeter fire barrier systems. ASTM E 2393, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers, provides guidance for the inspection of fire-resistive joints and perimeter fire barrier joint systems tested in accordance with the requirements of ASTM E 1966, Standard Test Method for Fire-Resistive Joint Systems, or with ANSI/UL 2079, Standard for Tests for Fire Resistance of Building Joint Systems. ASTM E 2393 contains a standardized report format, which would lead to greater consistency for inspections.

Independent inspection paid for by owner is in many specifications and referenced in this appendix using ASTM E 2393. As a result, there is an accreditation program available for firestop special inspection agencies.

A.8.9.3.1

The provisions of 8.9.3 are intended to restrict the interior vertical passage of flame and hot gases from one floor to another at the location where the floor intersects the exterior wall assembly. The requirements of 8.9.3 mandate sealing the opening between a floor and an
exterior wall assembly to provide the same fire performance as that required for the floor. ASTM E 2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale Multi-Story Test Apparatus, is a test method for evaluating the performance of perimeter fire barrier systems. Some laboratories have tested and listed perimeter fire barrier systems essentially in accordance with the ASTM method. The ASTM test method evaluates the performance of perimeter fire barrier systems in terms of heat transfer and fire spread inside a building through the floor/exterior wall intersection. The test method does not assess the ability of perimeter fire barrier systems to prevent the spread of fire from story to story via the exterior.

It is acknowledged that, when a fire grows to full room size (post flashover) in a multistory building, the fire might spread from the story of origin to the story above via the exterior. The phenomenon of exterior flame spread from window to window is sometimes referred to as a “leapfrog” effect. The leapfrog effect can occur in buildings with non-fire resistance-rated exterior walls, as well as in buildings with fire resistance-rated exterior walls having unprotected window openings on adjacent stories. Fire experience indicates that fire spread beyond the story of origin via the exterior can occur in 15 minutes to 20 minutes or less without fire department intervention.

The leapfrog effect is addressed in 37.1.4 by requiring that windows on adjacent stories be separated vertically a minimum of 36 in. (915 mm) by a 1-hour fire resistance-rated spandrel or exterior wall assembly or that a 30 in. (760 mm) 1-hour fire resistance-rated flame barrier, or “eyebrow,” project horizontally from the exterior facade between the windows. These measures are typically applied to buildings greater than three stories. However, actual fire experience has shown that a 36 in. (915 mm) spandrel might not be sufficient to prevent fire spread via the exterior from window to window. However, the requirements for 1-hour fire resistance-rated spandrels or eyebrows are traditionally waived in buildings protected by automatic sprinklers, and most high-rise buildings are equipped with automatic sprinklers.

In summary, fire safety in high-rise buildings is largely dependent on the successful operation of automatic sprinklers. In the rare case where automatic sprinklers fail to control a fire, and a fire grows to a large size (post flashover) in a multistory building and is located in a compartment bounded by an exterior wall, and the building is equipped with either non-fire-rated protected windows on adjacent stories or a non-fire resistance-rated exterior wall, fire might spread via the exterior to the story above the floor of fire origin in 15 minutes to 20 minutes. Experience has shown that fire spread via the exterior due to the leapfrog effect is relatively rare. However, under the conditions previously enumerated, such fire spread can even occur in buildings having floor/exterior wall intersections protected by perimeter fire barrier systems tested and fire resistance rated in accordance with the ASTM test method.
**Public Input No. 124-NFPA 5000-2015 [ Section No. 8.7.4 ]**

8.7.4 * Fire Door Closers.

8.7.4.1 Unless otherwise specified, fire doors shall be self-closing or automatic-closing.

8.7.4.2 Fire doors used to protect the means of egress shall be self-closing or automatic-closing in accordance with 11.2.1.8.1.

**Statement of Problem and Substantiation for Public Input**

Sections 8.7.4.1 and 8.7.4.2 are unnecessarily redundant.

**Submitter Information Verification**

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Submittal Date: Sat Jul 04 17:11:43 EDT 2015

**Committee Statement**

Resolution: FR-3515-NFPA 5000-2015  
Statement: ALL: At the end of the 2015 revision cycle a task group was formed to evaluate the requirements for opening protectives. The current requirements for opening protectives are unorganized and not presented in a logical, user friendly format. The goal of the proposed changes is to reorganize the provisions for opening protectives and to make consistent the provisions in both NFPA 101 and NFPA 5000. The proposed changes are intended to be strictly editorial in nature and include reordering and renumbering requirements for better usability and application of the opening protective provisions. Any revisions that were outside of the scope of the task group were discussed by the committee and are substantiated below.

Former section 8.7.6.2.1 was deleted as NFPA 257 requires all fire protection rated glazing shall be evaluated under positive pressure and is addressed by the general reference to NFPA 257.

Section 8.7.3.1: 2015 text has multiple references for fire doors to be compliant with NFPA 80. References to NFPA 80 was combined to require installation, inspection, testing, and maintenance in accordance with NFPA 80 in one section.
Section 8.7.3.4: The pointer to Section 11.2.1.8 was deleted as it is too limiting and implies that the provision may only be applicable to those doors in the means of egress as addressed by 11.2.1.8.1 or buildings with low or ordinary hazard contents.

Section 8.7.3.5: Existing provision referencing NFPA 72 was deleted as it is already addressed by the reference to NFPA 80 noted above.

Section 8.8.3 and 8.9.2.3: To be consistent with other opening protective, the ‘Testing, Installation, Inspection, and Maintenance’ directives for penetrations and joints need to be specific in the code. New language provides installation and maintenance provisions for penetrations. Language is consistence with opening protective such as fire doors and glazing providing language that installation, testing and maintenance be in accordance with NFPA 80.

Section 8.9: The current requirements do not clearly explain the purpose for the joint protection in the fire barrier or when a fire barrier is used as a smoke barrier. Revisions consolidate the requirements already scattered through the section into an easier to use format.

A.8.7.7.5 is being added for consistency with NFPA 101.
8.8.5 Vibration Isolation.

Where designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:

(1) It shall be made on either side of the wall or floor.
(2) It shall be designed for the specific purpose.

Statement of Problem and Substantiation for Public Input

This provision does not address anything. No purpose seems to be served by this section. It does not appear to limit anything nor impart meaningful guidance to the provision of vibration isolation.

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Committee Statement

Resolution: The committee's recommendation is to not delete at this time. The committee will review the three sections that reference vibration isolation in both 101 (Sections 8.3.5.4, 8.4.4.2, 8.5.6.6) and 5000 (Sections 8.8.5, 8.10.4.3, and 8.11.5.6) to determine their appropriate location in the code, if the provisions are needed in the codes and will update any language as necessary for the Second Draft meeting.
8.9.2.3 All joint systems between a fire barrier and a non-fire-resistance-rated floor or roof sheathing, slab or deck above shall be tested as a continuity head of wall joint system, at their maximum joint width, in accordance with ASTM E2837, Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies, and installed as tested. The system shall have an F rating/T rating of minimum 1 hour, but not less than that of the fire barrier.

Statement of Problem and Substantiation for Public Input

Reason:
NFPA Codes have requirements for continuity of vertical and horizontal fire resistance rated assemblies. Wall continuity (i.e. continuity of fire resistance) is required at joint openings, which are typically linear voids, gaps, openings, or other discontinuities within an assembly, or at the intersection with other assemblies. For the intersection of a rated wall assembly and nonrated horizontal assembly above (floor or roof), the joint between the two assemblies would need to provide the same fire resistance as the rated wall assembly. A joint detail with fire resistance less than that of the wall would allow for the propagation of fire and/or smoke to the other side of the wall much earlier than the rated wall would, thus diminishing the life safety function of the rated wall, and even making the wall near useless if the fire and/or smoke are able to spread very quickly through the joint above the wall to the other side of the fire barrier.

Test methods ASTM E1966 and UL 2079, which are referenced in section 8.3.6.5, are only applicable to the testing of joints between two intersecting assemblies if both of the assemblies are fire resistance rated. To allow the evaluation of the fire resistance of joint details between a fire resistance rated wall and a non-fire rated roof or floor above, ASTM began work in 2007 on a new test method. That test standard was completed and issued in 2011, and was issued as "ASTM E2837, Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies". With the standard having existed for almost 4 years, both UL and Intertek now have tested system listings in accordance with the standard.

It is important to note that none of the listed systems requires any modifications at all to the wall assembly or to the floor or roof assembly above. The listed systems simply specify the materials that are needed to fill and seal the joint in a manner that will prevent premature fire spread through that joint. As indicated by the title of the ASTM standard ("Continuity Head of Wall Joint Systems"), the test is designed to evaluate the continuity of the wall's fire resistance rating up to the underside of the floor or roof deck above. Passing the test means that the joint detail must not allow fire spread through the joint prior to the given fire resistance rating, which would normally be the fire resistance rating of the fire barrier wall.

Fire barriers are already required to form an effective membrane continuous from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The joint opening at the top of the rated fire barrier wall assembly, below the nonrated horizontal assembly, is part of the fire barrier, and as such, needs to be protected. The ASTM E 2837 Standard was create to evaluate continuity head-of-wall joint systems for this specific application, providing exactly the code-mandated performance. Using a tested joint detail, instead of allowing joint details to be improvised for each and every building and
then requiring the AHJ to approve the detail, will provide a measure of consistency, predictability, and an even level of life safety from one building to the next.

To achieve the rating, the joint system must remain in the opening during the fire resistance test and the hose stream test, and will have withstood the fire resistance test for the rating period equal to the rated wall assembly by preventing flaming on the unexposed side of the test specimen and on the underside of the nonrated horizontal assembly on the unexposed side. The Integrity test also ensures no occurrence of ignition of the cotton pad, which is related to the passage of hot gases.

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Committee Statement

Statement: The extension of the fire barrier to the next horizontal assembly needs to be tested as the assembly itself. The ASTM standard provides the continuity to protect the system consistent with the barrier.
8.11.2.3* Smoke barriers shall be designed to limit the combined passage of smoke through opening protectives, smoke dampers, joints, and through-penetrations at any floor level to not more than 0.75 cfm per square foot of total smoke barrier surface area, at a pressure difference of 0.1 in of water (25 Pa). The dimensions of the total surface area shall be measured from outside wall to outside wall and from floor slab to floor or roof deck above, including continuity through concealed spaces.

A8.11.2.3. The combined total smoke leakage rate through a smoke barrier can be calculated by adding the tested and reported leakage rates from all of the opening protectives, smoke dampers, joints and penetrations in a given smoke barrier. Some of these components have their leakage rates tested and reported at pressure differences other than 0.1 in water (25 Pa), due to inconsistencies between the individual component test methods. To facilitate the conversion of the reported leakage rates from their tested pressure difference to a common pressure difference of 0.1 in water (25 Pa), ASTM has published a guide, ASTM E3021-15, Standard Guide for Evaluating the Relative Effectiveness of Building Systems to Resist the Passage of Smoke Based on the Aggregation of Leakage Rates. This guide provides information on the pressure used to test the leakage rate for each of the components of interest, as well as the calculation to convert each of those reported leakage rates to a common delta P (pressure difference). The addition of the individual component leakage rates, all reported at or converted to 0.1 in. water (25 Pa), can then be used to determine the total expected design leakage through a given smoke barrier.

Statement of Problem and Substantiation for Public Input

Problem: A smoke barrier is designed and constructed to subdivide building spaces in order to restrict the movement of smoke. The intent of requiring a vertical or horizontal smoke barrier is to maintain a tenable condition on the non-fire side of the smoke barrier. The Code already recognizes that it is unrealistic to believe that a smoke barrier can be both functional in a building (with openings, services, etc.), and prevent the movement of 100% of the smoke in a fire incident, by stipulating requirements for leakage rated doors. What is still lacking is identifying a performance level (or “tolerance”) that is realistic and achievable for the total amount of leakage through a Smoke Barrier. Currently, the Code has no guidance or quantitative performance requirements on what quantity of maximum total leakage is acceptable.

Substantiation: This proposed change adds quantitative criteria to the requirements for the performance of Smoke Barriers. The criteria proposed here is intended to serve as a design requirement and not as a field test commissioning requirement. The Annex material is intended to provide guidance, if needed, to estimate the total flow through the different assemblies that are tested and listed at different pressures. This new requirement would apply to openings in the smoke barrier construction materials.

In 8.2.2.5, NFPA 101 currently includes requirements for leakage rated doors to be tested in accordance with a nationally recognized UL Standard (UL 1784) for the quantitative measurement of air leakage rates through door assemblies under prescribed conditions. In order to evaluate the effectiveness of a smoke barrier, it is necessary to conduct a summation of the leakage contribution of all installed opening protectives, smoke dampers, joints, and through-penetrations in the smoke barrier. This, in turn, allows the designer to compare the actual measured leakage against the maximum allowable leakage rate through the entire smoke barrier.

The Code has effectively already established the quantitative performance level of a smoke barrier by...
identifying the permitted number of openings for exits and exit access and then limiting the aggregate width of openings at any floor level in a Fire Wall to 25% of the length of the wall. Based on this maximum limit, the permitted passage of smoke can be inferred to be 0.75 cfm per square foot of total area, measured at a pressure of 0.1 in of water (25 Pa). Smoke and draft control doors complying with UL 1784 will have a maximum permissible leakage rate of 3 cfm/ft2. With such doors covering a maximum of 25% of the wall area, this equals 0.75 cfm/ft2 averaged over the entire wall area.

The leakage rates for the four elements mentioned are already tested for and published in the fire-resistance test listings for those products (e.g. in the UL directory). Unfortunately, the tests are conducted at slightly different pressures, mainly for reasons of convenience in performing the tests. A designer can use various methods to convert leakage rates at different pressures to the 0.1 in of water level. ASTM E3021-15, Standard Guide for Evaluating the Relative Effectiveness of Building Systems to Resist the Passage of Smoke Based on the Aggregation of Leakage Rates, can be used to walk the user through those calculations, and thus calculate the total leakage from openings, penetrations, joints and interfaces of the construction elements forming the smoke barrier.

This Guide provides a method of evaluating the relative effectiveness of building systems to resist the passage of smoke. The method of evaluating the relative effectiveness of a construction element is based on the aggregation of leakage rates of openings, penetrations, joints and interfaces of the construction elements forming the building structure.

The required Leakage rate information for smoke control dampers, leakage rated doors, joints, and penetrations are readily available. For example, with Joints and Penetrations, the UL and Intertek Directories identify these ratings as “L” ratings, and contain over a thousand penetration and joint designs which have already been tested and assigned an “L” rating. There is no additional effort or knowledge required to install these systems over that needed to install the basic through penetration systems for fire-resistance. Similarly, listed smoke-leakage rated doors and dampers are identified in these directories.

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Committee Statement

Resolution: The proposed annex language references the application of ASTM E3021 which was not available for the committee to review at this time. As worded, the proposed change may be difficult to apply.
Public Input No. 117-NFPA 5000-2015 [Sections 8.11.5.2, 8.11.5.3, 8.11.5.4, 8.11.5.5]

Sections 8.11.5.2, 8.11.5.3, 8.11.5.4, 8.11.5.5

8.11.5.2
Penetrations for cables, cable trays, conduits, pipes, tubes, vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a smoke barrier, or through the ceiling membrane of a roof/ceiling assembly of a smoke barrier, shall be protected by a listed system or a material capable of restricting the transfer of smoke tested in accordance with the requirements of UL 1479 for air leakage. The air leakage rate of the penetration assemblies measured at 0.30 inch (7.47 Pa) of water in both the ambient temperature and elevated temperature tests, shall not exceed:

1. 5.0 cfm per square foot (0.025 m³/s · m²) of penetration opening for each through-penetration firestop system; or
2. A total cumulative leakage of 50 cfm (0.024 m³/s) for any 100 square feet (9.3 m²) of wall area, or floor area.

8.11.5.3
Where a smoke barrier is also constructed as a fire barrier, the penetrations shall be protected in accordance with the requirements of Section 8.8 to limit the spread of fire for a time period equal to the fire resistance rating of the assembly, as required by 8.11.5, to restrict the transfer of smoke, unless the requirements of 8.11.5.4 are met.

8.11.5.4
Where sprinklers penetrate a single membrane of a fire resistance-rated assembly in buildings equipped throughout with an approved automatic fire sprinkler system, noncombustible escutcheon plates shall be permitted, provided that the space around each sprinkler penetration does not exceed ½ in. (13 mm), measured between the edge of the membrane and the sprinkler.

8.11.5.5
Where the penetration item uses a sleeve to penetrate the smoke barrier, the sleeve shall be securely set in the smoke barrier, and the space between the item and the sleeve shall be filled with a listed system or a material capable of restricting the transfer of smoke in accordance with 8.5.11.2.

Statement of Problem and Substantiation for Public Input

Problem: In the absence of a comprehensive approach to quantifying Smoke Barriers performance, the Building & Life Safety Codes already recognize that it is unrealistic to believe that a smoke barrier can be both functional in a building (with openings, services, etc.), and prevent the movement of 100% of the smoke in a fire incident, by stipulating requirements for leakage rated doors and dampers. What is still lacking is identifying a performance level (or “tolerance”) that is realistic and achievable for joints and penetrations in Smoke Barriers. Currently, the Code has no guidance or quantitative performance requirements on what maximum total leakage is acceptable.

Substantiation: Due to the lack of a comprehensive performance requirement or statement for smoke...
barrier leakage rates, NFPA 5000 currently includes requirements for individual components, such as
doors in corridors and smoke barriers, to be tested in accordance with a nationally recognized UL
Standard (UL 1784) for the quantitative measurement of air leakage rates through door assemblies
under prescribed conditions. There is a need to better define and quantify the performance of Smoke
Barriers & Smoke Partitions with respect to their ability to prevent smoke from migrating across them
in a fire situation. The existing language in section 8.5.6 of NFPA 5000 is intended to be a means of
providing some minimal level of performance for the through penetrations. The current language has
the potential to be manipulated to make the requirement ineffective because of the lack of specific
criteria. To better specify the limits for smoke leakage of through penetrations in Smoke Barriers it is
reasonable to require a total smoke barrier performance level per 100 ft² (for example) in addition to
dealing with individual items. By doing that, it would be possible to be more flexible with the individual
penetrations, but more comprehensive on the smoke barrier leakage performance.

This proposed Code change is intended to clarify and improve the Code regarding the requirements
for smoke leakage through penetrations in smoke barriers. This proposal would allow 5 cfm/ft² for
individual through penetrations as one option, and would also allow an alternative requirement for the
cumulative total leakage of all through-penetrations in a given area of smoke barrier.

For smoke and draft control doors, the LSC contains limits requires the addition of 3.0 cfm/sq ft for
each door within the 100 sq ft area (measured at 0.1 in of water column), since that is the limit for
smoke and draft control doors in UL 1784 and NFPA 105. The proposed 5 cfm/ft² value for leakage
through penetrations is based upon this criteria. It is essentially identical to the leakage rating of
smoke and draft control doors in smoke barriers, since 3 cfm/ft² measured at 0.1 in of water column is
equivalent to 5.2 cfm/ft² at 0.3 inches of water.

The 50 cfm suggested here is based on two approaches:

1. A very simplistic approach of a theoretical maximum of 10 through penetrations @ max allowed 5
   cfm/ft² in 100 ft² of wall or floor area.
2. The LSC permits 1 sq ft of leakage area per 1000 sq feet of wall space. Based on some
   fundamental assumptions about anticipated pressure differentials during fires, the cumulative value of
   50 cfm per 100 ft² proposed also represents approximately 50% of that permitted leakage.

Consequently, if it is necessary to use a through-penetration firestop system that has an L-Rating of
more than 5.0 cfm/ft², such as might be the case for a cable tray where additional leakage can occur
between the individual cables in a bundle, then the overall installation can still be compliant with the
Code either by spacing out the penetrations sufficiently to maintain the average leakage of 50
 cfm/100ft² or ensure that other through-penetrations within the same 100 ft² control area have
leakage rates that are low enough to compensate for one or more penetrations with higher L-Ratings.
Consequently, if the L-rating of a particular system being used is less than the maximum of 5 cfm/ft²,
then more through-penetrations could be installed in the same 100 ft² of wall area. Alternatively, an
individual through-penetration could be greater than 5 cfm/ft² if the total for the 100 ft² of wall or floor
area does not exceed the 50 cfm cumulative value.

The addition of the UL 1479 Air Leakage rating will provide a nationally recognized UL Standard for
the quantitative measurement of air leakage rates through a barrier containing penetrations under
prescribed conditions. This would follow the same approach currently taken in NFPA 5000 for other
elements within smoke barriers, and would be consistent with the current smoke barrier requirements
in other US Model Building Codes.

NFPA 5000 currently includes requirements for doors in corridors and smoke barriers to be tested in
accordance with a nationally recognized UL Standard (UL 1784) for the quantitative measurement of
air leakage rated through door assemblies under prescribed conditions. The addition of UL 1479
Leakage rating will provide a nationally recognized UL Standard for the quantitative measurement of
air leakage rates through a barrier containing through-penetrations under prescribed conditions. The
conditions of acceptance in ANSI/UL 1479 provides criteria for an assembly rating and an optional L
The L rating criteria determines the amount of air leakage, in cubic ft per minute per square ft of opening (CFM/sq ft), through the penetration system at ambient and/or 400°F air temperature at an air pressure differential of 0.30 in. W.C. The L ratings are intended to assist Authorities Having Jurisdiction, and others, in determining the suitability of through-penetrations firestop systems for the protection of service openings in floors, walls and smoke barriers for the purpose of restricting the movement of smoke across those assemblies. The UL and Intertek Directories identify these ratings as “L” ratings, and contains literally hundreds of penetration and joint designs that have already been tested and assigned an “L” rating. There is no additional effort or knowledge required to install these systems over that needed to install the basic through-penetrations firestop systems for fire-resistance. Just as with UL 1784, both of these standards measure air leakage at room temperature as well at 400°F, (representing hot and cold smoke).

Submitter Information Verification

Submitter Full Name: TONY CRIMI
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State:
Zip:
Submittal Date: Sat Jul 04 16:54:46 EDT 2015

Committee Statement

Resolution: FR-3510-NFPA 5000-2015
Statement: Penetrations through smoke barriers are to restrict the passage of smoke. In NFPA 101/5000, there is no performance test standard listed nor value provided for the designer to use for compliance. Using this performance requirement will provide a measure of consistency and predictability for the installed system.

A nationally recognized testing laboratory through performance testing proves that any product is smoke resistant after it is tested. Otherwise, smoke barriers receive whatever material that the contractors think works for limiting smoke. The quantified air leakage rating ("L") in UL 1479 provides designers a quantified value to communicate through construction documents to contractors for compliance.

Over 1/3 of the tested Firestop Systems have L Ratings. The labor and material to install an L rated firestop system is the same as non L Rated firestop assembly.

This would follow the same approach currently taken in NFPA 5000 for other elements within smoke barriers and would be consistent with the current smoke barrier requirements in other model codes. Consistent changes are also being proposed for NFPA 101.
Public Input No. 112-NFPA 5000-2015 [Section No. 8.11.7]

8.11.7 Joints.

8.11.7.1 The provisions of 8.11.7 shall govern the materials and methods of construction used to protect joints in between and at the perimeter of smoke barriers where smoke barriers meet other smoke barriers, the floor or roof deck above, or the outside walls.

8.11.7.2 Joints made within, between, or at the perimeter of smoke barriers shall be protected with a listed joint system or a material that is capable of restricting the transfer of smoke, tested in accordance with the requirements of UL 2079 for air leakage. The L rating of the joint system shall not exceed 5 cfm per linear foot (0.00775 m3/s m) of joint at 0.30 inch (7.47 Pa) of water for both the ambient temperature and elevated temperature tests.

8.11.7.3 Joints made within or between smoke barriers shall be protected with a listed joint system or a material that is capable of restricting the transfer of smoke in accordance with 8.11.7.2.

8.11.7.4 Smoke barriers that are constructed as fire barriers shall be protected with a listed joint system that is designed and tested to resist the spread of fire for a time period equal to the required fire resistance rating of the assembly in accordance with Section 8.9 and to restrict the transfer of smoke in accordance with 8.11.7.2.

8.11.7.5 Testing of the joint system in a smoke barrier that also serves as fire barrier shall be representative of the actual installation suitable for the required engineering demand without compromising the fire resistance rating of the assembly or the structural integrity of the assembly.

Statement of Problem and Substantiation for Public Input

Problem: Currently, the Code lacks guidance on quantitative performance requirements for the maximum total leakage that is acceptable for smoke barriers. In the absence of a comprehensive approach to quantifying Smoke Barriers performance, the Life Safety Code already recognizes that there are instances in Chapters 11 through 43 where leakage rated doors and dampers are required. What is still lacking is identifying a performance level that is realistic and achievable for joints and penetrations in Smoke Barriers.

Substantiation: This proposal applies to leakage rating of Joints in new construction, or where otherwise required by the Code. NFPA 5000 currently includes requirements for doors in corridors and smoke barriers to be tested in accordance with a nationally recognized UL Standard (UL 1784) for the quantitative measurement of air leakage rated through door assemblies under prescribed conditions. The addition of UL 2079 Leakage rating will provide a nationally recognized UL Standard for the quantitative measurement of air leakage rates through a barrier containing joints under prescribed conditions. The condition of acceptance in ANSI/UL 2079 provides criteria for an assembly rating and an optional L rating. The L rating criteria determines the amount of air leakage, in cubic ft per minute per square ft of opening (CFM/sq ft), through the penetration system at ambient and/or 400F air temperature at an air pressure differential of 0.30 in. W.C. The L ratings are intended to assist Authorities Having Jurisdiction, and others, in determining the suitability of joint systems for the
protection of openings in floors, walls and smoke barriers for the purpose of restricting the movement of smoke in accordance with the Code requirements. The UL Directory identifies these ratings as "L" ratings, and contains literally hundreds of penetration and joint designs that have already been tested and assigned an "L" rating. There is no additional effort or knowledge required to install these systems over that needed to install the basic joint systems for fire-resistance. Just as with UL 1784, both of these standards measure air leakage at room temperature as well at 400°F, (representing hot and cold smoke). The air leakage tests contained in UL 2079 are based on the air leakage test for doors and can provide the user with a numerical value for smoke through penetrations and joints in smoke barriers. The specific leakage criteria proposed here is identical to that contained in the International Building Code for Joints in Smoke Barriers.

This proposed Code change is intended to improve the Code regarding the requirements for smoke leakage of joints in smoke barriers. This requirement already exists in other US Building Codes.

Submitter Information Verification

Submitter Full Name: TONY CRIMI
Organization: AC Consulting Solutions Inc.
Affiliation: International Firestop Council
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Zip: 
Submittal Date: Sat Jul 04 16:43:48 EDT 2015

Committee Statement

Resolution: FR-3511-NFPA 5000-2015
Statement: Joints in or between smoke barriers are to restrict the passage of smoke. In NFPA 101/5000, there is no performance test standard listed nor value provided for the designer to use for compliance.

A nationally recognized testing laboratory through performance testing proves that any product is smoke resistant after it is tested. Otherwise, smoke barriers receive whatever material that the contractors think works for limiting smoke. The quantified air leakage rating ("L") based on UL 2079 testing provides designers a quantified value to communicate through construction documents to contractors for compliance.

Over 1/3 of the tested Firestop Systems have L Ratings. The labor and material to install an L rated firestop system is the same as non L Rated firestop assembly.

This would follow the same approach currently taken in NFPA 5000 for other elements within smoke barriers and would be consistent with the current smoke barrier requirements in other model codes.

Using this performance requirement will provide a measure of consistency and predictability for the installed system.
8.14.1.1

Any concealed combustible space in which building materials having a flame spread index greater than Class A are exposed shall be draftstopped as follows:

(1) Every exterior and interior wall and partition shall be firestopped at each floor level, at the top story ceiling level, and at the level of support for roofs.

(2) Every unoccupied attic space shall be subdivided into areas not to exceed 3000 ft² (280 m²).

(3) Any concealed space between the ceiling and the floor or roof above shall be draftstopped for the full depth of the space along the line of support for the floor or roof structural members and, if necessary, at other locations to form areas not to exceed 1000 ft² (93 m²) for any space between the ceiling and floor and 3000 ft² (280 m²) for any space between the ceiling and roof.

Statement of Problem and Substantiation for Public Input

This corrects a spelling error.

Submitter Information Verification

Submitter Full Name: Jim Muir
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Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 17:16:56 EDT 2015

Committee Statement

Statement: In reference to attic draftstops, both 101 and 5000 exempt attics with materials "having a flame spread index greater than Class A" There is no such thing as a flame spread index greater than Class A – flame spread index is a dimensionless, numerical value that comes from the tunnel test (ASTM E84); Class A refers to an interior finish classification defined by the code (FSI of 0-25 and SDI of 0-450).
8.14.1.3 Draftstopping materials shall be not less than $\frac{1}{2}$ in. (13 mm) type X gypsum board $\frac{45/32}{15}$ in. (12 mm) wood structural panel or other approved materials that are adequately supported.

Additional Proposed Changes

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<td>5000_PI26_FBC_Attic_Draftstopping_Evaluation_Final.pdf</td>
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Statement of Problem and Substantiation for Public Input

Koffel Fire Protection Engineering Associates completed a research study in 2014 entitled "Evaluation of Draftstopping Within Type V Combustible Concealed Attic Spaces." The study consisted of a literature review, field assessment, gap analysis and recommendations. The information derived from this study supports the need to revised the specification for materials utilized in draftstopping of attics. The literature review indicated:

1. The requirement for draftstopping appeared in the first edition of the 1927 Uniform Building Code originating a requirement for 1” partitions of wood or approved material.
2. Various clarifications on the construction materials also changed through the editions.
3. There is currently no documented technical basis for the legacy code requirements and the materials.
4. The current code specified materials provide little, if any, ability to contain a fire spread in a concealed combustible attic space.

IBC Section 722 provides calculated fire-resistance ratings for materials that have an inherent fire-resistance rating. The materials that are allows to serve as draftstopping are documented with the following calculated fire-resistance ratings:

- 0.5-inch gypsum board 10 minutes from Table 722.2.1.4(2) (not Type X)
- 25 minutes for Type X
- 15/32 inch wood structural panel 10 minutes from Table 722.6.2(1)

Recent significant fires in buildings with unsprinklered concealed combustible attics demonstrate the need for additional performance from draftstopping materials in limiting fire spread in these spaces. This proposal changes the materials so a minimum 25 minute calculated fire resistive material is utilized in lieu of the current allowance for a 10 minute material. This will provide improvements to fire containment in non-fire sprinkler protected concealed combustible spaces, improved firefighter safety and allow firefighters much needed additional time during response and mobilization in dealing with fires that progress into these spaces.

See the Koffel report for added documentation.

Submitter Information Verification
Committee Statement

Resolution: FR-3503-NFPA 5000-2015
Statement: Recent significant fires in buildings with unsprinklered concealed combustible attics demonstrate the need for additional performance from draftstopping materials in limiting fire spread in these spaces. This revision changes the materials so a minimum 25 minute calculated fire resistive material is utilized in lieu of the current allowance for a 10 minute material. This will provide improvements to fire containment in non-fire sprinkler protected concealed combustible spaces, improved firefighter safety and allow firefighters much needed additional time during response and mobilization in dealing with fires that progress into these spaces.
EVALUATION OF DRAFTSTOPPING
WITHIN TYPE V
COMBUSTIBLE CONCEALED ATTIC SPACES

Prepared for:
Florida Building Commission
and
The University of Florida

Prepared by:
Koffel Associates, Inc.
8815 Centre Park Drive, Suite 200
Columbia, MD 21045-2107

U013-01

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## APPENDICES

A – Copies of Legacy Codes ................................................................. A1
B – Florida Attic Fire Incident Data for Multifamily Dwellings .......................... B1
C – NFPA Attic Fire Report ................................................................. C1
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1. EXECUTIVE SUMMARY

The University of Florida has contracted Koffel Associates, Inc., on behalf of the Florida Building Commission, to evaluate attic draftstopping for the State of Florida in relation to the International Building Code (IBC). This evaluation will focus on the applicable code requirements, installation practices, and firefighting provisions.

This version of the report is for a pre-final submission on June 2, 2014. This report is now 100% complete.

2. PROJECT SCOPE

The scope of this project is to evaluate draftstopping in concealed combustible attic spaces. Draftstopping is required in concealed spaces in Type V (combustible) construction to subdivide attic spaces. Draftstopping (draftstop) is defined by the International Building Code as: “a material, device or construction installed to restrict the movement of air within open spaces of concealed areas of building components such as crawl spaces, floor/ceiling assemblies, roof/ceiling assemblies and attics.”

The primary focus of the evaluation will be Group R-2 (apartments). Requirements pertaining to Group R-1 (hotels) and other use groups will also be discussed. When of Type V construction, Group R-2 buildings are typically limited to two to five stories in height depending on the type of construction.

The evaluation will consist of three components, which include a literature review, field assessment, and gap assessment. The literature review will include a review of current code requirements, code history, non-IBC approaches, technical literature, incident data, and firefighting challenges. The field assessment includes observations from a five-day field survey to verify both existing buildings and buildings under construction. The gap assessment will determine if additional information is required to complete the evaluation.

The scope was limited strictly to reviewing the attic draftstopping provisions of the codes. However, other code requirements will be discussed, as necessary, such as sprinkler protection, fire alarm, and penetration protection.

2.1 Special Consideration

The field assessment was conducted in the greater Orlando area as arranged by volunteers on behalf of the Florida Building Commission. This field assessment could leave the volunteers and the facilities evaluated open for scrutiny by the Florida Building Commission or local fire marshals. Thus, in this report, Koffel Associates, Inc. has kept any items observed generic and without reference to the facility’s name when discussing the field assessment. Koffel Associates will maintain confidentiality throughout this project.
Koffel Associates has noted all major items observed to the owner of the facility. Our surveys do not relieve the Owner of responsibility for compliance with the requirements of the applicable codes, whether observed by us or not. The Owner is still solely responsible for code compliance.

3. CODE REFERENCES

The following codes and standards are used for this analysis:

- International Building Code (IBC), 2012 Edition
- Florida Building Code (FBC), 2010 Edition
- NFPA 72, National Fire Alarm and Signaling Code, 2010 Edition

The primary reference of this evaluation will be the IBC, 2012 Edition, as Florida will use this code as the basis for the next edition of their building code. Note that the IBC and FBC are very similar. Any differences between the codes related to the code requirements addressed herein will be noted.

All terminology used in this report will be as defined by the IBC. For example, draftstopping can also be referred to as “draft stop,” “fire block,” or “fire stop.” These other terms may be common in the field, but the code has different definitions for this terminology. In addition, this terminology has changed over time and is present in the legacy codes.

4. LITERATURE REVIEW

The literature review includes an analysis of current code requirements, code history, non-IBC approaches, technical literature, incident data, and firefighting challenges. Each item is discussed in the sections below.

4.1 Current Code Requirements

The current code requirements for attic draftstopping are in IBC Section 718.4. Draftstopping is required as summarized below for combustible attics:

- Group R-2
  - Required if three or more dwelling units
  - Draftstopping must be installed to subdivide concealed combustible attic spaces into areas not exceeding 3,000 sq ft or above every two dwelling units, whichever is smaller
    - Where a corridor also serves as a dwelling unit separation, draftstopping is only required above one of the corridor walls.

- Group R-1
  - Required in all buildings
  - Draftstopping must be installed in line with dwelling units
- Where a corridor also serves as a dwelling unit separation, draftstopping is only required above one of the corridor walls.

- Other Groups
  - Required in all buildings
  - Draftstopping must be installed to subdivide concealed combustible attic spaces into areas not exceeding 3,000 sq ft

Draftstopping materials must comply with the following:

- Must extend to the underside of the roof sheathing
- Draftstopping materials must not be less than
  - 0.5-inch gypsum board
  - 0.375-inch wood structural panel
  - 0.375-inch particleboard
  - 1-inch nominal lumber
  - cement fiberboard
  - batts or blankets of mineral wool or glass fiber
  - other approved materials adequately supported.
- The integrity of draftstops must be maintained.
- Openings in the partitions must be protected by self-closing doors with automatic latches.

Per the IBC Commentary, draftstopping in attics is required for the following reasons:

- It is intended to separate the buildings horizontally
- It acts as a barrier to smoke and gases
- It is designed to prevent considerable damage from fire spread.

4.2 Penetrations and Joints

There are currently no specific requirements for the draftstopping to be provided with penetration or joint protection. This protection includes through-penetration firestop systems, approved fire-resistant joint systems, or some other approved means. The draftstopping must only be constructed tight to the roof and the integrity needs to be maintained.

4.3 Sprinkler Protection

Draftstopping is not required if the attic is protected by an approved, supervised automatic sprinkler system. Per IBC Section 903.2.8, a sprinkler system must be provided in all Group R fire areas. An NFPA 13R sprinkler system is allowed per IBC Section 903.3.1.2. NFPA 13R does not require sprinklers to be installed in concealed combustible spaces, including attics. Thus, attics in Type V construction are not typically sprinkler protected and still require draftstopping, even if sprinklers are provided in the apartment units below as allowed by NFPA 13R.

Note that NFPA 13 requires most combustible concealed spaces to be sprinkler protected. However, NFPA 13 is not required to be applied to Group R buildings of four stories or less, or five-level pedestal buildings as discussed below.
4.4 Pedestal Buildings

Based on IBC Table 503 with the sprinkler modifications of IBC Section 504.2, Type VB construction (non-rated) allows Group R-2 buildings of three stories in height and Type VA construction (1-hr rated) allows four stories. Additionally, IBC Section 510.4 allows a Group S-2 parking garage beneath Group R if the parking garage is open or constructed of Type I (noncombustible) construction. Thus, a Type VA building is allowed to have five levels and still be classified as four stories in height because of the following:

- 510.4 Parking beneath Group R. Where a maximum one story above grade plane Group S-2 parking garage, enclosed or open, or combination thereof, of Type I construction or open of Type IV construction, with grade entrance, is provided under a building of Group R, the number of stories to be used in determining the minimum type of construction shall be measured from the floor above such a parking area. The floor assembly between the parking garage and the Group R above shall comply with the type of construction required for the parking garage and shall also provide a fire-resistance rating not less than the mixed occupancy separation required in Section 508.4.

- The FBC does make one modification to include: “The number of stories to be used in determining the height in stories in accordance with Section 903.2.11.3 shall include the parking garage as a story.”

This type of arrangement is commonly referred to as a “pedestal” building.

4.4.1 Sprinkler Protection for Pedestal Buildings

An NFPA 13R sprinkler system only applies to four-story buildings. However, with Type VA construction and a pedestal arrangement, an NFPA 13R system can still be used in a five-level pedestal building as the building height is classified as being four stories. Additionally, all editions of NFPA 13R evaluated for this project include Paragraph A.1.1 which reads:

“The height of a building above grade plane is determined by model building codes, which base the height on the average height of the highest roof surface above grade plane. For further information on the building height story limits, see model building codes.”

Additionally, the commentary and Handbook of the 2013 Edition of NFPA 13R supports that the pedestal does not count as a story. NFPA 101®, The Life Safety Code®, Chapter 4 also supports that the pedestal does not count as a story.

NFPA 13R is based on testing that has demonstrated the ability of residential sprinkler systems to control fires that have growth rates similar to those involving residential furnishings. NFPA 13R was limited to Group R occupancies in four-story buildings because fire burns upward much faster than it burns horizontally. The four-story limit was selected by the Committee as a reasonable limit given the types of Group R occupancies already in existence, such as garden apartments. The Committee also chose the four-story criteria due to firefighting access provision and as this was the height at which standpipe systems were typically required by the building code.
Thus, there is precedence to allow five-story pedestal buildings with NFPA 13R sprinkler protection and no sprinkler protection in the attics. Draftstopping is also still required in the attic.

4.4.2 Fire Alarm

IBC Section 907.2.9 sets the requirements for fire alarm systems in Group R-2 occupancies. All fire alarm systems must be in accordance with NFPA 72. A manual fire alarm system is typically required if a sleeping unit is located three or more stories above the lowest level of exit discharge, a sleeping unit is located one or more stories below the highest level of exit discharge, or the building contains more than 16 dwelling units. The manual fire alarm system is not required if the building is sprinkler protected to NFPA 13 or NFPA 13R.

Smoke alarms are also required in the following locations:

- On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms
- In each room used for sleeping purposes
- In each story within a dwelling unit, including basements but not including crawl spaces and uninhabitable attics

These smoke alarms are required to be interconnected within the dwelling unit. However, connection to the main fire alarm system is not required.

4.4.3 Maintenance

There are currently no specific requirements for inspection, testing, or maintenance of draftstopping at the time of construction or in an existing building. There are only generic requirements for it to be kept in place.

4.5 Legacy Code History

The requirement for draftstopping appeared in the 1927 Edition of the Uniform Building Code (UBC), which was also the first edition of the code. The UBC was published by the International Council of Building Officials (ICBO). This edition required the following:

- “All attic spaces or spaces between ceiling and the underside of roofs shall be divided into horizontal areas of not more than twenty-five hundred (2,500) square feet with tight one-inch (1”) partitions of matched wood or of approved incombustible materials. All openings through these partitions shall be protected by self-closing doors of the same thickness and materials as the partition.”

The requirement exists in the current edition of the IBC. However, the UBC changed the area to 3,000 sq ft in 1970. Various clarifications on the construction materials also changed between the editions.

The other two legacy codes were the Standard Building Code by the Southern Building Code Congress International (SBCCI) and The BOCA National Building Code by the Building Officials and Code Administrators International (BOCA). Note that the BOCA National
Building Code was originally the BOCA Basic Building Code before the rights to use the “National Building Code” was acquired by BOCA. These codes had requirements that were almost exactly the same as the UBC and have been in the codes since the first editions.

See Appendix A for copies of the legacy codes.

4.5.1 Basis for the Legacy Code Requirements

There is currently no documented basis for the legacy code requirements. The 1971 Edition of Fire Protection through Modern Building Codes, by the American Iron and Steel Institute, provides the best explanation of these requirements. In addition to discussing how draftstopping is intended to separate the building horizontally, the following concepts are discussed:

- Almost any size opening will allow fire spread, since all that is necessary to transmit fire from one point to another is simply the passage of hot gases. An opening no larger than the cross section of a pencil is sufficient to permit fire-generated hot gases to move through and thus spread the fire.
- Even with good firefighting, fire and smoke are likely to be communicated through concealed spaces in the construction, especially as the internal construction cannot be fully assured.
- In Type V construction, despite protection by fire-resistive ceilings or wall finishes, there is the ever present danger of a fire originating behind the protective finish, or that enough heat will get behind the finish to ignite the combustible construction materials and thus cause fire spread.
- In the plenum area of protected wood joist floor and ceiling assemblies, temperatures, recorded less than one-half hour after the start of the standard fire test, were high enough to ignite the joists. What this means is: the interior of a fire-resistance-rated combustible floor and ceiling assembly may not only burn during the course of a fire in the space below, but it would in all probability, continue to burn, possibly unnoticed, even after openly burning material has been extinguished. This is the prime reason for draftstopping combustible wall, partition, floor, and roof constructions. By so doing, the spread of fire may be kept within circumscribed building areas.

It is possible that the original 2,500 sq ft requirement comes from old requirements of NFPA 13 for sprinkler subdivision. However, Koffel Associates could not verify this correlation. The 1922 Edition of NFPA has generic requirements for design areas and there is no reference to 2,500 sq ft.

4.5.2 Penetrations and Joints

In older buildings, it is common to find penetrations open or just stuffed with mineral wool or even combustible materials. What are not the current requirements for penetration protection, which include through-penetration firestop systems and approved fire-resistant joint systems, first started to appear in prominence in the legacy codes in the 1980’s. These requirements were to address this gap in the code after some major fires of this time period, such as the Browns Ferry and MGM Grand fire in Las Vegas. The IBC, upon its first edition in 2000, started to expand on these requirements. In the current IBC, penetration protection and joint system protection must now be applied to fire-resistance rated building elements, such as fire walls, fire
barriers, fire partitions, and shaft enclosures. However, these concepts have never applied to
draftstopping throughout the code cycles.

4.6 Non-IBC Approaches

The following are some non-IBC approaches to protection of concealed combustible spaces in
the United States of America:

- **NFPA 13** – Concealed spaces entirely filled with noncombustible insulation do not
  require sprinkler protection per Section 8.15.1.2.7.
  - This concept assumes that the combustible structural members would not be
  exposed, thereby reducing the likelihood of ignition.
- **NFPA 13** – 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 when tested in accordance with ASTM E 84, 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, do not require sprinkler
  protection per Section 8.15.1.2.10.
- **NFPA 13** – Concealed spaces in which the exposed materials are constructed entirely of
  fire retardant–treated wood as defined by NFPA 703, Standard for Fire Retardant-Treated
  Wood and Fire-Retardant Coatings for Building Materials, do not require sprinkler
  protection per Section 8.15.1.2.11.
- **NFPA 5000** – Building materials having a flame spread index of Class A are exempted.
  Requires similar materials to IBC and areas not to exceed 3,000 ft² (280 sq m).

Some of the above items are not directly related to draftstopping. However, these items do
represent methods to protect attics.

The following are some international approaches to draftstopping:

- **Canada** – requires separation to 3,230 sq ft (300 sq m) with similar materials to the IBC.
  The area may be increased to 6,460 sq ft (600 sq m) with a Class A interior finish rating.
- **England (Approved Document B)** – requires separation in-line with any
  compartmentation below up to the roof. Allows similar materials to the IBC, but does
  “recommend” a 30-minute rating. Lists allowed opening as follows: access doors, pipes,
  cables, conduits, openings with a fire damper, ducts that are fire-resisting or fitted with a
  fire damper.
- **Sultanate of Oman** – requires separation to 3,230 sq ft (300 sq m) with similar materials
to the IBC. Also allows the void to be filled with a “fire prevention” material.

Most of these requirements are very similar to the current IBC requirements. A lot of the
International codes mirror the American requirements.
4.7 Technical Materials

There is limited documentation available on materials and testing of draftstopping. Koffel Associates could not find any that was pertinent to this project. There are two reasons for this lack of documentation. The first reason is that the codes define the draftstopping requirements by referring to common building materials, without providing performance requirements. The other reason is that the draftstopping code requirements have undergone very few major code changes over the years.

4.7.1 Calculated Fire Resistance

The IBC Section 722 provides calculated fire-resistance ratings for materials that have an inherent fire-resistance rating, but may not be specifically justified by documented data. Examples of these ratings are generic lightweight concrete or gypsum board. The materials allowed to serve as draftstopping materials are documented with the following calculated fire-resistance ratings:

- 0.5-inch gypsum board
  - 10 minutes from Table 722.2.1.4(2) (not Type X)
  - 25 minutes for Type X
- 0.375-inch wood structural panel
  - 5 minutes from Table 722.6.2(1)
- 0.375-inch particleboard
  - 5 minutes from Table 722.6.2(1)
- 1-inch nominal lumber
  - 20 minutes from Table 722.6.2(2)
- Cement fiberboard
  - no rating specified
- Batts or blankets of mineral wool or glass fiber
  - 15 minutes from Table 722.6.2(1) (only if part of another assembly)

These calculated fire-resistance ratings are very minimal. Note that these fire-ratings can be increased by 20 minutes if the materials above are supported by wood studs on the non-exposed sides. Most fire-resistance rated construction requires a minimum of 30-minutes.

4.7.2 Attic Sprinklers

Attic sprinklers are a type of sprinkler specifically designed to protect attic spaces. Attic sprinklers can be used instead of standard sprinklers and have been a “more recent” development in sprinkler protection. Attic sprinklers are considered special application sprinklers, allowed by NFPA 13, and are listed. A typical attic sprinkler is spaced a maximum of every 6 ft, covers a roof span up to 60 ft, and protects up to 400 sq ft. A typical attic sprinkler has a minimum operating pressure of 9.6 to 22.6 psi and a minimum flow of 13 to 38 gpm, depending on roof span and slope. These sprinklers are intended to provide superior fire protection in attic spaces and cost savings by eliminating branch line materials and the associated installation labor.

By comparison, a typical residential sprinkler has a minimum operating pressure of 7 to 16.7 psi and a minimum flow of 13 to 20 gpm, depending on area of coverage.
4.8 Incident Data

There is limited documentation available on incident data for demonstrating the effectiveness of draftstopping. Koffel Associates found very little information pertinent to this project. Most of the incident data that is available only related to attic fires. Most of this incident data did not confirm the presence or absence of draftstopping. This lack of data specifying draftstopping was present even in NFPA’s National Fire Incident Reporting System (NFIRS).

These statistics also do not include information on fires that started within an occupied space and then spread into the attic. These scenarios are far more common.

Two primary sources for incident data were analyzed. One source was the Florida Division of State Fire Marshal, Bureau of Fire Prevention. The other source was the NFPA report, “Structure Fires Starting in the Attic, With and Without Automatic Extinguishing Systems, by Occupancy Type” by Marty Ahrens from September, 2013.

4.8.1 Florida Data

Appendix B contains the incident data from the Florida Division of State Fire Marshal, Bureau of Fire Prevention, from 2011 to 2013 for multifamily dwellings of three to four stories. This data indicates that most fires were started by electrical arcing or lighting strikes. These types of fires resulted in no injuries or deaths. The data indicates that fires caused by lightning strikes were costly, on the average $87,500, but rare, on the average of two per year.

The interesting item to note is that in only one of the fourteen fires were the occupants alerted by smoke detection. The code currently requires no automatic smoke detection in these spaces.

4.8.2 NFPA Data


The information in this report indicated that the fires involving sprinkler protection resulted in a 25% increase in the amount of the damage to buildings as compared to buildings without sprinkler protection for “apartment or multi-family dwelling” fires. This seems counter intuitive. Explanations include that the sprinkler protected buildings are more valuable as a whole and sprinkler water flow may cause water damage below the fire. Note that accidental activations were not included in these statistics.

This data also confirmed, as did the data from the Florida Division of State Fire Marshal, Bureau of Fire Prevention, that injuries and deaths from these types of fires are rare, even without sprinkler protection.

This NFPA incident data estimated 732 fires in attics of “apartment or multi-family dwellings” between 2003-2011, which equates to 82 fires per year. In 2012, NFPA estimated 97,000 apartment fires. Thus, attic fires represent a small percentage (less than 1%) of the fire problem in apartments.
4.9 Firefighting

There is limited documentation available on firefighting in buildings with and without draftstopping. Most of the information available only related to attic fires. Some of the views expressed in this section are opinions of personnel at Koffel Associates who have firefighting experience.

4.9.1 Firefighting with Voids in General

Fire in any type of combustible void space is difficult for firefighters, whether it be underneath the floor, through a shaft, or in the attic. Large open void spaces are inherent in combustible structures. These void spaces provide an abundance of fuel and air for a fire to grow quickly. Fuels in a void space could consist of wood joists, utilities, or even plastic products, such as PVC piping or insulation. Here are some of the dangers a void space fire may present:

- More challenging to access for manual suppression
- Hidden fire resulting in delayed detection
- Increased fuel load
- Rapid fire spread
- Accumulation of fire gases
- Increased backdraft potential
- Direct degradation to structure
- Early structural failure

4.9.2 Firefighting in Attics Fires

Void space fires can only be extinguished if the fire breaks out of the void space or the firefighters gain access to it. Standard approaches to firefighting in attics include pulling down the ceiling below or removing the roof to gain access. Standard methods for removing the roof include physically cutting a hole in the roof at or near the fire. The entire length of the roof can also be cut (known as “trench” cutting), which attempts to make a fire break in the building for the fire to vent itself. The procedures for removing both the ceiling or roof are difficult to perform and personnel resource intensive. One possible tactic is to use a piercing nozzle from an aerial apparatus directly through the roof.

Firefighters must do the work above while trying to keep the fire compartmented, which involves not cutting through fire walls, fire barriers, or draftstopping directly. Not cutting through these items is difficult as a firefighter cannot often see these items below.

The very fact that attics are high off the ground makes firefighting difficult. A standard firefighter ground ladder is 24 ft. Larger ladders between 35 and 45 ft are also available. However, in a 4-story structure of 5-level pedestal building, these ground ladders may not reach. These heights will require aerial apparatus, which if available, can often be difficult to position to access a fire.
It is difficult for firefighters to access the attics directly both due to these spaces being difficult to enter and then difficult in which to maneuver. Even if better access was provided for firefighting, the firefighters would still have to manage with balancing on the joists, low clearances, and other obstructions.

“Brannigan’s Building Construction for the Fire Service,” now published through NFPA, is a good source for understanding firefighting aspects of building construction. This book concurs with many of the points above. This book also discusses the chance of explosions from the buildup of hot gases, although, the frequency of these types of explosions are unknown. These explosions may or may not be caused by backdraft or flashover. This book even goes on to note that there are no testing standards for draftstopping.

5. FIELD ASSESSMENT

Koffel Associates completed the surveys for this evaluation on May 5-9, 2014. These surveys were conducted in the greater Orlando area as arranged by volunteers from the Florida Building Commission.

5.1 Overview

The following buildings of Type V construction were surveyed:

1) Seven R-2 Apartments under construction
2) Five existing R-2 Apartments
3) Two existing R-2 Hotels
4) Two existing Business buildings

An existing R-2 Hotel of Type II construction and an R-2 Apartment under construction of Type III construction were also surveyed during this work. These two buildings were only surveyed as Koffel Associates was unaware of the construction type until arriving on-site. They are included in this report as valuable information was observed.

At each R-2 Apartment property, two to three buildings were observed. A summary of our findings can be found in Appendix D and pictures can be seen in Appendix E.

5.2 Observations for Type V Construction

The following were major general observations during the surveys:

1) Plywood (wood structural panel) is the most common draftstopping material (See Pictures 01 through 03).
2) The only other draftstopping material observed was gypsum (See Pictures 04 and 05).
3) Very few of the buildings had any type of penetration or joint protection.
4) Most draftstopping was installed parallel to the trusses. The only case where it was more efficient to install perpendicular to the trusses was where each truss was installed in two sections (due to size and site constraints) and a corridor ran the entire length of the building perpendicular to the trusses (See Pictures 06 and 07).
The following were major observations for the R-2 Apartments:

1) Only 1 of the 7 buildings under construction had draftstopping that was deficient. This deficiency appeared to be from lack of details provided on the permit drawings (See Picture 08).
2) Two of the 7 buildings under construction were draftstopped along every unit separation, even though this is currently not required.
3) Five of the 7 buildings under construction had draftstopping that was aligned with the corridors or unit separation walls, rather than evenly dividing the building into 3,000 sq ft sectors.
4) All of the existing buildings were draftstopped along every unit separation, even though this was historically not required.
5) Two of the 5 existing buildings had minor deficiencies (See Pictures 10 through 12). However, these could be compensated by the fact the draftstopping was over-designed.
6) Every building surveyed had draftstopping parallel with the corridors.

The following were major observations for other uses:

1) The two existing R-2 Hotels were both sprinkler protected in the attics, though this is not required.
2) The two existing R-2 Hotels had draftstopping in the attics, though this was not required due to the sprinkler protection. However, it was not maintained in one of the properties.
3) One of 2 Business buildings was observed without draftstopping.
4) The Business building with draftstopping had major deficiencies (See Picture 13).

5.3 Observations for Other Construction Types

The existing R-2 Hotel of Type II construction had a wood truss roof. It was sprinkler protected in the attic. However, draftstopping was still provided, even though it was not required. Additionally, this draftstopping was not maintained.

The R-2 Apartment under construction is of Type III construction with exterior walls of fire-retardant-treated wood (See Picture 14). This arrangement is allowed by IBC Section 602.3. Normally, Type III buildings have non-combustible exterior walls. Type III construction with exterior walls of fire-retardant-treated wood is difficult to construct as the exterior wall must be load bearing and cannot be tied into any of the studwork internal to the building. This arrangement appeared to be constructed correctly at the property observed except for at a concrete fire wall, which would create an exterior wall (See Picture 15). The fire wall also appeared to be constructed incorrectly as it was not independent of the attached concrete parking garage.

The R-2 Apartment under construction of Type III construction also used interstitial sprinklers. This specialty type of sprinkler requires draftstopping to 1,000 sq ft per the listing of the sprinkler (See Picture 16). However, this draftstopping was deficient as it was not continuous.
5.3.1 Miscellaneous

The following items were noted during the surveys:

1) Draftstopping is often desired over unit separations to mitigate security concerns.
2) Lightning strikes can create both instantaneous fires and smoldering (slow-developing) fires (See Pictures 17 and 18).
3) Terracotta roofs appear to be common in Florida.
4) There were few properties constructed before 1990 in the region where the surveys were conducted.
5) The draftstopping was designed by the architects and approved in permit submission.
6) The contractors in the field did not attempt to modify the draftstopping in the field, even when acknowledging it was over-designed.
7) The average cost estimate for installing one 60-ft long draftstop in new construction with plywood is about $1,000. The cost for four to five draftstops in one building is about $5,000.
8) The building department is responsible for permitting and inspection of the draftstopping in the field. The building department often only inspects the draftstopping at substantial completion.
9) Fire marshals are not usually involved in permitting and not responsible for reviewing draftstopping. However, fire marshals are more likely to inspect the properties more often both during construction and during the life of the building.
10) Existing R-2 Apartment observed had high occupancy rates of 95 to 100 percent as noted by the management companies.
11) Existing R-2 Apartment observed was not aware of major work occurring in the attics, even by local utilities or cable provider, as noted by the management companies.

6. DISCUSSION

This section will discuss major items in the report.

6.1 Literature Review

The following major items should be noted of the literature review:

1) The materials currently allowed to serve as draftstopping are common building materials and have a small calculated fire-resistance rating. More robust materials could be considered.
2) NFPA 13R versus NFPA 13 sprinkler protection for five-level pedestal buildings should be clarified in the next edition of the Florida Building Code if the Florida Building Commission wants to deviate from the national code.
3) There is currently no documented basis for the legacy code requirements.
4) The requirements for penetration protection, which include a through-penetration firestop system, and fire-resistant joint systems, are “more recent” code requirements and have expanded since the first edition of the IBC. However, these concepts were never applied to draftstopping throughout the code cycles.
   a. Consideration can be given to some form of penetration and/or joint protection for draftstopping.
5) There are two possible alternates to draftstopping as documented in NFPA:
   a. NFPA 5000 exempts attics with a flame spread index of Class A.
   b. NFPA 13 does not require sprinkler protection in areas filled with noncombustible insulation or fire retardant wood.

6) International codes are very similar to the IBC requirements.

7) There is limited documentation available on materials and testing of draftstopping.

8) Attic sprinklers provide a possible solution for making attic sprinkler protection more practical and to reduce costs.

9) Incident data from the Florida Division of State Fire Marshal, Bureau of Fire Prevention, indicates that most fires were started by electrical arcing or lighting strikes.
   a. Lighting protection options could merit further research.

10) There are no requirements for automatic detection in attic spaces. Based on the incident data reviewed from the Florida Division of State Fire Marshal, Bureau of Fire Prevention, there appear to be delays in occupant notification for attic fires.
    a. Additional automatic detection options could merit further research.

11) Per NFPA incident data, attic fires represent a very small percentage of fires in apartments.

12) Fighting a fire in an attic is difficult for the fire service. Based on current construction methods, there appears to be few options to improve firefighting in attics with draftstopping.
    a. The prevalence of terracotta roofs in Florida increase difficulties in Florida. Terracotta cannot be cut by the fire department and must be removed (often with a sledge hammer) before access can be gained to the roof itself.

6.2 Field Investigation

The following major items should be noted of the field investigation:

1) The draftstopping observed was generally in excellent condition in the R-2 Apartments, except for one building under construction.

2) Ten of the 12 R-2 Apartments had draftstopping that was parallel to the trusses and/or corridors. In these cases, the draftstopping was aligned with the corridors or/and unit separation walls, rather than evenly dividing the building into 3,000 sq ft sectors.
   a. This arrangement can be considered good practice as the draftstopping can be consider an extension of the fire-resistance rated barriers below. This arrangement also makes it easier for the fire department to predict where the draftstopping will be.

3) The draftstopping observed was generally in poor condition in the Group B occupancy buildings.

4) Plywood (wood structural panel) is the most common draftstopping material.

5) Very few of the buildings have any type of penetration or joint protection.

6) Type III construction with exterior walls of fire-retardant-treated wood must be permitted and inspected carefully. This includes reviews of all structural drawings by fire protection reviewers.

7) Building officials and fire marshals should better coordinate permitting and inspection duties, which should include cross-training in disciplines.
Items 1 and 2 were not anticipated results of this evaluation. It is a general assumption that draftstopping is poorly installed and maintained. This assumption could be an exaggeration of the actual problem. Additionally, the properties surveyed had characteristics supporting good draftstopping based on that they were newer buildings, the buildings have low turn-over rates, were fully managed properties, and limited work was noted in them. This survey could result in more deficiencies in a more established and dynamic urban area. More deficiencies could be found in older buildings. Note that the oldest building surveyed was constructed in 1993. Additionally, only rented apartments were observed and no condominium units.

We did note major deficiencies in the Group B occupancy buildings, but these buildings are not in the same risk factor as Group R-2. Additionally, we observed draftstopping not being maintained in buildings in which draftstopping was installed, but not required.

6.3 Summary

Limited conclusions can be derived from this investigation. Limited information is available as only a small percentage of fires start in the attic and the draftstopping is constructed out of common building materials. Intuitively, increasing the level of draftstopping, such as providing penetration/joint protection or constructing a full 1-hr fire barrier, would increase the performance of draftstopping in a fire. However, the increase in performance may not be necessary and could be difficult to predict if the fire burns under the draftstopping.

Additionally, requiring sprinkler protection in the attics is an obvious method of mitigation. However, the cost versus just providing draftstopping is prohibitive. For example, it costs about $5,000 to install five draftstops in a typical new building. However, $5,000 is the equivalent cost for just a dry-pipe valve. In addition, consideration can be given to providing a limited sprinkler system; for example, one attic sprinkler every 3,000 sq ft. A single attic sprinkler could be considered equivalent to a water curtain. This would provide limited protection, but would provide notification of a fire in attic as attic fires are not often discovered immediately.

7. GAP ASSESSMENT

The most definitive follow-up item that could be derived from this report is for a code change to limit the materials to Type X gypsum. This code change would be based on the fire performance of Type X gypsum over the current material allowed and a minimal difference in cost. Based on the calculated fire-resistance ratings, plywood is rated for 5-minutes and Type X gypsum is rated for 25-minutes, which could represent a five-fold increase in fire performance. This additional fire performance will give the fire department additional time to respond to the fire.

Based on costs in RS Means and unit prices on building supplier websites, the installation cost of plywood versus Type X are minimal. The cost comparison even appears to favor gypsum installation. See Appendix F for RS Means cost data. These costs would also be significantly less than the cost to sprinkler protect the attics.

7.1 Other Assessments

Koffel Associates also has the following recommendations for further evaluation in order of recommended priority:
1) Prepare a code change as follows: “Draftstopping must be installed parallel to the trusses and aligned with the unit separation walls, unless provided above a corridor wall.”

2) Survey any attic fires to determine if the draftstopping delays the fires.
   a. This would require a large amount of coordination with the local fire department. It may not be possible due to litigation concerns.
   b. $3,000, including expenses, for Koffel Associates to survey the building and prepare a report.

3) Research options for a limited sprinkler system in attic in lieu of draftstopping.

4) Surveying buildings in a more established and dynamic urban area. Examples would be in Miami, Tampa, and Jacksonville. This could also be coupled with surveys outside of Florida. An example would be the DC/Baltimore metro areas.

5) Research ways of mitigating lightning strike fires and whether additional protection is necessary.

6) Conduct full-scale testing of draftstopping. For example, create a 6,000 sq ft mock-up of an attic. Perform four tests to include the following scenarios: no draftstopping, with draftstopping, draftstopping with penetration/joint protection, and with limited sprinkler protection.
   a. This type of testing would be costly; approximately $100,000 per test if performed through a testing laboratory. However, there may be ways to reduce this cost.

8. CONCLUSION

We believe this report provides a comprehensive evaluation of draftstopping in Florida.

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APPENDIX A

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clearance for the piping. Where a partition containing such piping runs parallel to the floor joists, the joists underneath such partitions shall be doubled and spaced to permit the passage of such pipes and shall be bridged with solid bridging. Where plumbing, heating or other pipes are placed in or partly in a partition necessitating the cutting of the soles or plates, a metal tie not less than one-eighth (1/8) inch thick and one and one-half (1 1/2) inches wide shall be fastened to the plate across and to each side of the opening with not less than four (4) sixteen-penny (16d.) nails.

(g) Openings in stud partitions and walls shall be framed around with double studs at each side and double headers across the top resting on the short stud at each end. The double header shall be placed on edge and shall be trussed above for all openings over four (4) feet in width or where more than two (2) studs are cut away.

(h) Wood lath, furring or framing shall be placed not less than two (2) inches from any chimney and not less than four (4) inches from the back of any fireplace.

(i) Where wood partitions and masonry walls join, bolts ten (10) inches long with two-inch by five-inch by one-fourth inch (2" x 5" x 1/4") iron plate washers shall be built into the masonry wall opposite each line of fire blocking and near the top, top plate or ribbon in each partition. The projecting end of the bolt shall pierce the partition and be securely fastened thereto.

Sec. 2508. (a) Valley rafters shall be not less than one and five-eighths by five and one-half inches (1 5/8" x 5 1/2") in size.

(b) Flashings shall be placed around all openings in and extensions of mechanical appliances or equipment through the roof.

(c) Anchors for joists and rafters shall be provided where they enter masonry walls and also where they are parallel to masonry walls as specified for joists in Section 2506 (f).

Sec. 2509. (a) Wood trusses and truss framing shall have all joints accurately cut and fitted together so that each bearing is true and drawn tight to the full bearing. All such trusses shall be properly secured in place by lateral bracing.

(b) Washers of sufficient size to distribute the loads properly shall be used in connection with rods or metal members. Before a truss is loaded, the tension rods shall be well tightened.

(c) Timber trusses shall be securely anchored to the wall at points of bearing.

Sec. 2510. (a) Fire stops shall be provided at all intersections of interior and exterior walls with floors, ceilings and roof in such a manner as to effectively cut off communication by fire through hollow concealed spaces and prevent both vertical and horizontal drafts.

(b) Purred walls shall have fire stopping placed immediately above and below the junction of any floor construction with the walls or shall be fire-stopped the full depth of the joist.

(c) All stud walls or partitions shall have a continuous row of bridging or fire stopping which shall form a complete and effective separation in the entire width of partition at that point, placed in such a manner that there shall be no concealed air spaces greater than seven (7) feet in any dimension. Fire stops shall be the full width of the studding and sufficiently stiff to act as lateral bracing for the individual studs.

(d) Stair stringers shall be fire-stopped at least once in the middle portion of each run, and shall be fire-stopped by a header beam at the top and bottom, so as to effectively prevent the passage of fire. Full width fire blocking shall be placed between studs along and in line with the run of stairs adjoining such partitions.

(e) When sliding doors are pocketed in partitions, such pockets shall be completely fire-stopped at end, sides, top and bottom.

(f) All spaces between chimneys and wood framing shall be solidly filled with refuse mortar, loose cinders or other incombustible material placed in incombustible supports.

(g) All fire-stopping as required in this Section shall be not less than two (2) inches in thickness and not less in width than the enclosed space within the partition except as provided in paragraph (f) hereof for chimneys.

(h) All attic spaces or spaces between ceilings and the underside of roofs shall be divided into horizontal areas of not more than twenty-five hundred (2500) square feet with tight one-inch (1") partitions of matched wood or of approved incombustible materials. All openings through these partitions shall be protected by self-closing doors of the same thickness and materials as the partition.
Sec. 3205. (a) Access. An attic access opening shall be provided in the ceiling of the top floor of buildings with combustible ceiling or roof construction. The opening shall be located in a corridor or hallway of buildings of three or more stories in height, and readily accessible in buildings of any height.

The opening shall be not less than twenty-two inches by thirty inches (22" x 30").

Thirty-inch (30") minimum clear head room shall be provided above the access opening.

Attics with a maximum vertical clear height of less than thirty inches (30") need not be provided with access openings.

For ladder requirements see Uniform Building Code, Volume II, Mechanical.

(b) Area Separations. Enclosed attic spaces formed of combustible construction shall be divided into horizontal areas not exceeding 3000 square feet by partitions extending from the ceiling to the roof.

Such partitions shall be not less than one-half-inch (½") thick gypsum wallboard, or one-inch (1") nominal thickness tight-fitting wood, ¾-inch thick plywood, or approved non-combustible material adequately supported.

Openings in the partitions shall be protected by self-closing doors constructed as required for the partitions.

EXCEPTION: Where the entire attic is equipped with an approved automatic fire-extinguishing system, the attic space may be divided into areas not to exceed 9000 square feet.

(c) Ventilation. Where determined necessary by the Building Official due to atmospheric or climatic conditions, enclosed attics and enclosed rafter spaces formed where ceilings are applied direct to the underside of roof rafters, shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain and snow. The net free ventilating area shall be not less than 1/150 of the area of the space ventilated, except that the area may be 1/300 provided at least 50 per cent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least three feet (3') above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.

Sec. 3206. (a) When Required. Smoke and heat vents shall be installed in accordance with the provisions of this Section as follows:

1. In Groups G and F Occupancies over 50,000 square feet in single floor area.

2. In Group E Occupancies over 15,000 square feet in single floor area.
such finish does not exceed 0.025 of an inch in thickness, and is applied directly to a non-combustible base.

*For interior finish and decoration for Group E, Assembly Occupancy, see Section 512.3.

SECTION 705 — FIRESTOPPING

(a) Firestopping shall be provided in all walls and partitions to cut off all concealed draft openings both horizontal and vertical, and to form an effectual fire barrier between stories and between the upper story and the roof space.

(b) Walls, including masonry walls furred with combustible material, and stud partitions shall be effectively firestopped with non-combustible material at floors, ceilings, and roofs, except in those parts of a building which are framed with wood, the firestopping may be of wood not less than two (2) inches in nominal thickness. See Section 1703.

(c) All openings around exposed pipes or power shafting shall be filled with approved non-combustible material, or shall be closed off by close-fitting metal caps at the ceiling and floor line, and on each side of a wall or partition.

(d) All openings for belts and conveyors shall be provided with approved slotted doors, or be otherwise closed off. Belts shall not pass through fire-walls.

(e) No firestopping shall be covered or concealed until inspected by the Building Official.

(f) In combustible roof construction, where ceilings or concealed spaces occur, such spaces shall be divided into horizontal areas of not more than three thousand (3,000) square feet (except one and two family dwellings) with tight partitions of non-combustible material or of approved wood construction consisting of one-half inch exterior plywood or of not less than two thicknesses of one (1) inch nominal lumber with joints broken.

(g) All openings through these partitions shall be protected by self-closing doors of approved construction meeting the partition requirements.

(h) Except in 1 and 2-family dwellings, when stairs are of wood or of combustible construction, the space between stair stringers shall be firestopped at top and bottom, and firestopping shall also be provided between studs, along and in line with run of stair adjoining such partition.

(i) Floors and roof constructed of combustible materials shall be firestopped at walls and partitions where openings occur. When wood joists run parallel to a wall, the space between the wall and the nearest joist shall be not less than two and one-half (2½) inches and shall be solidly filled with non-combustible material.

7-11
above the sidewalk. Retractable awnings shall be securely fastened to the building and shall not extend closer than twelve (12) inches from the curb line. They shall be equipped with a mechanism or device for raising and holding the awning in a retracted or closed position against the face of the building.

313.2.2 Fixed or permanent awnings: The clearance from the sidewalk to the lowest part of any fixed or permanent awning shall be the same as required in Section 313.2.1 for retractable awnings. Fixed or permanent awnings installed above the first story shall not project more than four (4) feet.

313.3 Canopies: Canopies shall be constructed of a metal framework, with an approved covering, attached to the building at the inner end and supported at the outer end by not more than two (2) stanchions with braces anchored in an approved manner and placed not less than two (2) feet in from the curb line. The horizontal portion of the framework shall be not less than eight (8) feet nor more than twelve (12) feet above the sidewalk and the clearance between the covering or valance and the sidewalk shall be not less than seven (7) feet. The width of canopies shall not exceed eight (8) feet.

313.4 Special applications of awnings: Rigid awnings supported in whole or part by members resting on the ground and used for patio covers; car ports; summer houses or other similar uses shall comply with the requirements of Section 313.5 for design and structure. Such structures shall be braced as required to provide rigidity.

313.5 Design and construction: Fixed awnings, canopies and similar structures shall be designed and constructed to withstand wind or other lateral loads and live loads as required by Article 7 of this code with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration.

SECTION 314.0 SUBDIVISION OF ATTIC SPACES

314.1 General: The attic spaces of all buildings, except where the roof and attic are of noncombustible or fireproof construction, shall be subdivided into areas not exceeding three thousand (3,000) square feet by means of approved fire stops. When doors or other openings are provided in such subdividing partitions, they shall be of noncombustible or similarly protected materials and the construction shall be tightly fitted around all ducts or other assemblies piercing such partitions.

SECTION 315.0 TEMPORARY STRUCTURES

315.1 General: Pursuant to a variance granted by the board of appeals under the provisions of Section 127.0, the building official may issue a permit for temporary construction as approved by the board of appeals.
APPENDIX B

FLORIDA ATTIC FIRE INCIDENT DATA FOR MULTIFAMILY DWELLINGS
<table>
<thead>
<tr>
<th>Incident Data</th>
<th>Heat Source</th>
<th>Fire Cause</th>
<th>Total Loss</th>
<th>Fatalities / Injuries</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/7/2012</td>
<td>Electrical arcing</td>
<td>All Other Causes</td>
<td>$0</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
<tr>
<td>8/13/2012</td>
<td>Electrical arcing</td>
<td>All Other Causes</td>
<td>$0</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
<tr>
<td>8/13/2012</td>
<td>Electrical arcing</td>
<td>Exposure from Another Fire</td>
<td>$0</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
<tr>
<td>8/13/2012</td>
<td>Electrical arcing</td>
<td>Exposure from Another Fire</td>
<td>$0</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
<tr>
<td>8/13/2012</td>
<td>Electrical arcing</td>
<td>Exposure from Another Fire</td>
<td>$0</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
<tr>
<td>4/10/2013</td>
<td>Lightning discharge</td>
<td>Natural Cause</td>
<td>$10,000</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
<tr>
<td>7/21/2012</td>
<td>Lightning discharge</td>
<td>Natural Cause</td>
<td>$70,000</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>6/21/2013</td>
<td>Lightning discharge</td>
<td>Natural Cause</td>
<td>$115,000</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>8/18/2012</td>
<td>Lightning discharge</td>
<td>Natural Cause</td>
<td>$120,000</td>
<td>0</td>
<td>Unknown</td>
</tr>
<tr>
<td>6/30/2013</td>
<td>Lightning discharge</td>
<td>Natural Cause</td>
<td>$122,500</td>
<td>0</td>
<td>Alerted occupants</td>
</tr>
<tr>
<td>5/12/2012</td>
<td>Operating equipment</td>
<td>All Other Causes</td>
<td>$1,503,000</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>10/10/2012</td>
<td>Undetermined</td>
<td>All Other Causes</td>
<td>$0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>8/23/2011</td>
<td>Undetermined</td>
<td>Natural Cause</td>
<td>$21,000</td>
<td>0</td>
<td>Did not alert occupants</td>
</tr>
</tbody>
</table>
APPENDIX C

NFPA ATTIC FIRE REPORT
Structure Fires Starting in the Attic, With and Without Automatic Extinguishing Systems, by Occupancy Type

Marty Ahrens
Fire Analysis and Research Division
National Fire Protection Association

September 2013
Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

Keywords:

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this analysis are available from:

National Fire Protection Association
One-Stop Data Shop
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
e-mail: osds@nfpa.org
phone: 617-984-7443

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Structure Fires Starting in the Attic, With and Without Automatic Extinguishing Systems, by Occupancy Type

This analysis contains four tables intended to provide reasonably comparable estimates of fires in sprinklered and non-sprinklered attics over two different time periods. National estimates were derived from the U.S. Fire Administration’s National Fire Incident Reporting System (NFIRS) and NFPA’s annual fire department experience survey. Due to changes in the data definitions and reporting instructions in NFIRS, caution must be used in comparing data from the two periods.

Tables 1 and 2 show estimated annual averages for non-confined structure fires (NFIRS incident type 110-129, excluding incident types 113-118) that began in the attic or vacant crawl space above the top story (NFIRS area of origin 74), by occupancy type, or in NFIRS terms, property use. The NFIRS 5.0 Complete Reference Guide notes that this area of origin includes cupolas, concealed roof/ceiling spaces, and steeples. Most NFIRS reports today are entered directly into a computer, and the Data Dictionary definition is simply “Attic: vacant, crawl space above top story.” Confined and non-confined structure fires are discussed below.

Version 5.0 of NFIRS (NFIRS 5.0) was first introduced in 1999. Its usage gradually increased over the next few years. By 2003, 79% of the data in NFIRS was originally collected according to the NFIRS 5.0 rules. Estimates from the transition years of 1999-2002 are considered less stable and are not included in this analysis. The data element in NFIRS 5.0 for incident type was expanded to three digits and includes a category of structure fires collectively referred to as “confined fires.” These include cooking fires confined to the vessel of origin, confined chimney or flue fires, confined trash fires, confined fuel burner or boiler fires, confined commercial compactor fires, and confined incinerator fires (incident type 113-118). Other structure fire incident types are referred to as “non-confined structure fires.” Note that it is possible for the fire to be limited to the object of origin in a non-confined structure fire. Data about fire protection equipment and other casual elements are not required for the so-called “confined fires” but are sometimes provided. Because these scenarios would be unusual for this particular area of origin, these fires were excluded from the analysis.

Table 3 shows estimated averages of structure fires in properties with no automatic extinguishing systems (AES) (NFIRS AES presence = N). Table 2 shows comparable estimates for properties in which sprinklers were present (NFIRS AES presence = 1 and NFIRS type of AES = 1-3 ). Note that the directions in the Complete Reference Guide define AES presence as “the existence of an AES within the AES’s designed range of a fire.” The small number of fires coded as having partial systems, or initially coded as having AES present but the equipment failed because it was not in the fire area, were excluded from this analysis.

Table 3 and 4 provide the closest comparable estimates for the 19-year period of 1980-1998, i.e., structure fires (NFIRS incident type 11) that began in the ceiling and roof assembly or concealed roof/ceiling space (NFIRS area of origin 74). Note that there is no distinction between confined and non-confined fires during this time and that the area of origin definition does NOT specifically mention attic. Table 3 shows estimated averages of structure fires in properties with no automatic extinguishing systems.
extinguishing systems (NFIRS AES performance = 8). Table 4 shows comparable estimates for properties in which AES was present, regardless of operation. (NFIRS performance = 1-3).

For all four tables, the occupancy type or property use is shown if it is a major category heading, or at least 1% of the fires occurred in or at that type of occupancy. Unclassified subcategories, such as “unclassified residential property,” are not shown, even when the percent of fires exceeded 1%.

The estimates in this analysis are national estimates of fires reported to U.S. local fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. All estimates include proportional shares of fires in which the area of origin and AES data were undetermined or not reported. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Property damage estimates were NOT adjusted for inflation. The extent of rounding was based on the number of total fires. In Table 1 and 4, fires are rounded to the nearest ten, in Table 2 to the nearest one, and in Tables 3, to the nearest hundred. Civilian deaths and injuries are rounded to the nearest one. Direct property damage is rounded to the nearest million in Tables 1 and 3 and to the nearest hundred thousand in Table 2 and 4. Sums may not equal totals due to rounding errors. See Appendix A for more details about the methodology used to calculate national estimates.
Table 1.
Non-Confined Structure Fires that Began in the Attic, Vacant Crawl Space Above the Top Story, or Concealed Roof/Ceiling Space and in which No Automatic Extinguishing System was Present by Occupancy Type 2003-2011 Annual Averages

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential property</td>
<td>9,580</td>
<td>26 (97%)</td>
<td>120 (93%)</td>
<td>$454 (83%)</td>
</tr>
<tr>
<td>One-or-two-family home</td>
<td>8,600</td>
<td>22 (81%)</td>
<td>97 (76%)</td>
<td>$384 (70%)</td>
</tr>
<tr>
<td>Apartment or multi-family dwelling</td>
<td>680</td>
<td>1 (4%)</td>
<td>13 (10%)</td>
<td>$61 (11%)</td>
</tr>
<tr>
<td>Store or office property</td>
<td>370</td>
<td>0 (0%)</td>
<td>4 (3%)</td>
<td>$36 (7%)</td>
</tr>
<tr>
<td>Office, bank or mail facility</td>
<td>90</td>
<td>0 (0%)</td>
<td>1 (0%)</td>
<td>$11 (2%)</td>
</tr>
<tr>
<td>Grocery or convenience store</td>
<td>60</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$6 (1%)</td>
</tr>
<tr>
<td>Public assembly property</td>
<td>230</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>$36 (7%)</td>
</tr>
<tr>
<td>Eating or drinking establishment</td>
<td>110</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$13 (2%)</td>
</tr>
<tr>
<td>Place of worship or funeral property</td>
<td>80</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$13 (2%)</td>
</tr>
<tr>
<td>Storage property</td>
<td>200</td>
<td>1 (3%)</td>
<td>1 (1%)</td>
<td>$4 (1%)</td>
</tr>
<tr>
<td>Vehicle storage, garage or fire station</td>
<td>80</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$1 (0%)</td>
</tr>
<tr>
<td>Manufacturing property</td>
<td>40</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$7 (1%)</td>
</tr>
<tr>
<td>Educational property</td>
<td>40</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>$2 (0%)</td>
</tr>
<tr>
<td>Special property</td>
<td>30</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$1 (0%)</td>
</tr>
<tr>
<td>Basic industry, utility or defense property</td>
<td>30</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>Institutional property</td>
<td>30</td>
<td>0 (0%)</td>
<td>1 (0%)</td>
<td>$2 (0%)</td>
</tr>
<tr>
<td>Unclassified or unknown property use</td>
<td>60</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$2 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>10,620</td>
<td>27 (100%)</td>
<td>128 (100%)</td>
<td>$548 (100%)</td>
</tr>
</tbody>
</table>

Note: Sums may not equal totals due to rounding. All major occupancy categories are shown, as are subcategories that accounted for at least 1% of the fires. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire.
Source: NFIRS 5.0 and NFPA survey.
Table 2.
Non-Confined Structure Fires that Began in the Attic, Vacant Crawl Space above the Top Story, or Concealed Roof/Ceiling Space in which Sprinklers were Present, by Occupancy Type
2003-2011 Annual Averages

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential property</td>
<td>117</td>
<td>0 (NA)</td>
<td>1 (60%)</td>
<td>$14.3 (52%)</td>
</tr>
<tr>
<td>Apartment or multi-family dwelling</td>
<td>52</td>
<td>0 (NA)</td>
<td>0 (24%)</td>
<td>$5.8 (21%)</td>
</tr>
<tr>
<td>One-or-two-family home</td>
<td>39</td>
<td>0 (NA)</td>
<td>0 (23%)</td>
<td>$5.7 (21%)</td>
</tr>
<tr>
<td>Store or office property</td>
<td>40</td>
<td>0 (NA)</td>
<td>0 (27%)</td>
<td>$5.1 (18%)</td>
</tr>
<tr>
<td>Office, bank or mail facility</td>
<td>11</td>
<td>0 (NA)</td>
<td>0 (16%)</td>
<td>$3.6 (13%)</td>
</tr>
<tr>
<td>Grocery or convenience store</td>
<td>7</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.3 (1%)</td>
</tr>
<tr>
<td>Department store or unclassified general retail</td>
<td>6</td>
<td>0 (NA)</td>
<td>0 (12%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Laundry, drycleaning or professional supplies or services</td>
<td>4</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.5 (2%)</td>
</tr>
<tr>
<td>Specialty shop</td>
<td>3</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td>Personal service or recreational or home repair store</td>
<td>3</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td>Household goods sales or repair</td>
<td>3</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td>Textile or apparel sales</td>
<td>1</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Service station or vehicle sales, service or repair</td>
<td>1</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.3 (1%)</td>
</tr>
<tr>
<td>Public assembly property</td>
<td>35</td>
<td>0 (NA)</td>
<td>0 (13%)</td>
<td>$6.3 (23%)</td>
</tr>
<tr>
<td>Eating or drinking establishment</td>
<td>24</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$2.5 (9%)</td>
</tr>
<tr>
<td>Place of worship or funeral property</td>
<td>4</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.3 (1%)</td>
</tr>
<tr>
<td>Club</td>
<td>4</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$3.4 (12%)</td>
</tr>
<tr>
<td>Library, museum, courthouse or other public property</td>
<td>2</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Studio or theatre</td>
<td>2</td>
<td>0 (NA)</td>
<td>0 (13%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Institutional property</td>
<td>26</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.9 (3%)</td>
</tr>
<tr>
<td>Nursing home</td>
<td>17</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.7 (2%)</td>
</tr>
<tr>
<td>Prison, jail or police station</td>
<td>2</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Clinic or doctor's office</td>
<td>2</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td>Hospital or hospice</td>
<td>2</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td>Mental retardation or substance abuse</td>
<td>1</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td>Manufacturing property</td>
<td>11</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.9 (3%)</td>
</tr>
</tbody>
</table>
Table 2. (Continued)
Non-Confined Structure Fires that Began in the Attic, Vacant Crawl Space above the Top Story, or Concealed Roof/Ceiling Space in which Sprinklers were Present, by Occupancy Type
2003-2011 Annual Averages

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational property</td>
<td>6 (3%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Preschool through grade 12</td>
<td>3 (1%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Adult education or college classroom</td>
<td>1 (1%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Storage property</td>
<td>2 (1%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Warehouse, residential or self-storage</td>
<td>1 (1%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Special property</td>
<td>1 (0%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Basic industry, utility or defense property</td>
<td>0 (0%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Unclassified or unknown property use</td>
<td>1 (1%)</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>241 (100%)</strong></td>
<td><strong>0 (NA)</strong></td>
<td><strong>2 (100%)</strong></td>
<td><strong>$27.7 (100%)</strong></td>
</tr>
</tbody>
</table>

NA - Not applicable because the total is zero.

Note: Sums may not equal totals due to rounding. All major occupancy categories are shown, as are subcategories that accounted for at least 1% of the fires. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire.

Source: NFIRS 5.0 and NFPA survey.
<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential property</td>
<td>11,900</td>
<td>25 (91%)</td>
<td>125 (83%)</td>
<td>$162 (61%)</td>
</tr>
<tr>
<td>One- or two-family dwelling</td>
<td>10,600</td>
<td>22 (81%)</td>
<td>107 (71%)</td>
<td>$133 (51%)</td>
</tr>
<tr>
<td>Apartment, tenement or flat</td>
<td>1,100</td>
<td>2 (8%)</td>
<td>14 (9%)</td>
<td>$24 (9%)</td>
</tr>
<tr>
<td>Hotel, motel or inn</td>
<td>100</td>
<td>0 (1%)</td>
<td>4 (3%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>Store or office property</td>
<td>1,300</td>
<td>0 (1%)</td>
<td>6 (4%)</td>
<td>$42 (16%)</td>
</tr>
<tr>
<td>Office property</td>
<td>300</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>$11 (4%)</td>
</tr>
<tr>
<td>Food or beverage sales</td>
<td>200</td>
<td>0 (1%)</td>
<td>1 (1%)</td>
<td>$7 (2%)</td>
</tr>
<tr>
<td>Motor vehicle or boat sales or services</td>
<td>200</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>Specialty shop</td>
<td>100</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$2 (1%)</td>
</tr>
<tr>
<td>Household goods sales or repairs</td>
<td>100</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$4 (2%)</td>
</tr>
<tr>
<td>Recreation, hobby or home repair</td>
<td>100</td>
<td>0 (0%)</td>
<td>1 (0%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>supply sales or personal services</td>
<td>100</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>General item store</td>
<td>100</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>Special property</td>
<td>900</td>
<td>0 (0%)</td>
<td>3 (2%)</td>
<td>$5 (1%)</td>
</tr>
<tr>
<td>Construction or unoccupied property</td>
<td>700</td>
<td>0 (0%)</td>
<td>2 (1%)</td>
<td>$4 (2%)</td>
</tr>
<tr>
<td>Storage property</td>
<td>800</td>
<td>1 (2%)</td>
<td>4 (3%)</td>
<td>$10 (4%)</td>
</tr>
<tr>
<td>Vehicle storage</td>
<td>300</td>
<td>0 (1%)</td>
<td>2 (1%)</td>
<td>$2 (1%)</td>
</tr>
<tr>
<td>Agricultural product storage</td>
<td>300</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>Unclassified or unknown-type storage property</td>
<td>100</td>
<td>0 (1%)</td>
<td>1 (0%)</td>
<td>$1 (0%)</td>
</tr>
<tr>
<td>General item storage</td>
<td>100</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>$2 (1%)</td>
</tr>
<tr>
<td>Public assembly property</td>
<td>800</td>
<td>1 (2%)</td>
<td>6 (4%)</td>
<td>$24 (9%)</td>
</tr>
<tr>
<td>Eating or drinking establishment</td>
<td>500</td>
<td>0 (1%)</td>
<td>3 (2%)</td>
<td>$12 (5%)</td>
</tr>
<tr>
<td>Place of worship or funeral parlor</td>
<td>200</td>
<td>0 (1%)</td>
<td>1 (1%)</td>
<td>$6 (2%)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>300</td>
<td>0 (0%)</td>
<td>2 (2%)</td>
<td>$9 (3%)</td>
</tr>
<tr>
<td>Metal or metal product manufacture</td>
<td>100</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>$2 (1%)</td>
</tr>
</tbody>
</table>
Table 3. (Continued)
Structure Fires that Began in the Ceiling and Roof Assembly or Concealed Roof/Ceiling Space and in which No Automatic Extinguishing System was Present, by Occupancy Type 1980-1998 Annual Averages

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic industry, utility or defense property</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>$3 (1%)</td>
</tr>
<tr>
<td>Agriculture</td>
<td>100</td>
<td>0</td>
<td>1</td>
<td>$2 (1%)</td>
</tr>
<tr>
<td>Educational property</td>
<td>100</td>
<td>0</td>
<td>1</td>
<td>$6 (2%)</td>
</tr>
<tr>
<td>Non-residential school through grade 12</td>
<td>100</td>
<td>0</td>
<td>1</td>
<td>$5 (2%)</td>
</tr>
<tr>
<td>Institutional</td>
<td>100</td>
<td>0</td>
<td>1</td>
<td>$1 (0%)</td>
</tr>
<tr>
<td>Unclassified or unknown-type property use</td>
<td>100</td>
<td>1</td>
<td>0</td>
<td>$2 (1%)</td>
</tr>
<tr>
<td>Total</td>
<td>16,600</td>
<td>27</td>
<td>150</td>
<td>$264 (100%)</td>
</tr>
</tbody>
</table>

Note: Sums may not equal totals due to rounding. All major occupancy categories are shown, as are subcategories that accounted for at least 1% of the fires. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire.

Source: NFIRS and NFPA survey.
Table 4. (Continued)

Structure Fires that Began in the Ceiling and Roof Assembly or Concealed Roof/Ceiling Space And in which Some Type of Automatic Extinguishing Equipment was Present, by Occupancy Type
1980-1998 Annual Averages

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal or metal product manufacture</td>
<td>70</td>
<td>0 (NA)</td>
<td>2 (19%)</td>
<td>$0.4 (3%)</td>
</tr>
<tr>
<td>Wood, furniture or paper manufacture or printing</td>
<td>50</td>
<td>0 (NA)</td>
<td>0 (2%)</td>
<td>$0.8 (6%)</td>
</tr>
<tr>
<td>Food manufacturing</td>
<td>20</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.8 (6%)</td>
</tr>
<tr>
<td>Chemical, plastic or petroleum manufacturing or processing</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (2%)</td>
<td>$3.3 (25%)</td>
</tr>
<tr>
<td>Textile manufacture</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Vehicle assembly or manufacture</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (5%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Unclassified or unknown-type manufacturing property</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (4%)</td>
<td>$0.3 (2%)</td>
</tr>
<tr>
<td>Footwear, wearing apparel, leather or rubber manufacture</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (4%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td><strong>Store or office property</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General item store</td>
<td>40</td>
<td>0 (NA)</td>
<td>1 (8%)</td>
<td>$0.4 (3%)</td>
</tr>
<tr>
<td>Food or beverage sales</td>
<td>30</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.3 (2%)</td>
</tr>
<tr>
<td>Office property</td>
<td>30</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.5 (4%)</td>
</tr>
<tr>
<td>Textile or wearing apparel sales</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.4 (3%)</td>
</tr>
<tr>
<td>Specialty shop</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Household goods sales or repairs</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.2 (1%)</td>
</tr>
<tr>
<td>Professional supply sales or services</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Motor vehicle or boat sales or services</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (4%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Recreation, hobby or home repair supply sales or personal services</td>
<td>0</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td><strong>Public assembly</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eating or drinking establishment</td>
<td>40</td>
<td>0 (NA)</td>
<td>1 (6%)</td>
<td>$1.0 (7%)</td>
</tr>
<tr>
<td>Club</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.1 (0%)</td>
</tr>
<tr>
<td><strong>Institutional property</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Care of the aged</td>
<td>40</td>
<td>0 (NA)</td>
<td>2 (23%)</td>
<td>$0.4 (3%)</td>
</tr>
<tr>
<td>Care of the sick or injured</td>
<td>20</td>
<td>0 (NA)</td>
<td>1 (7%)</td>
<td>$0.0 (0%)</td>
</tr>
</tbody>
</table>

Table 4. (Continued)
<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Fires</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential property</td>
<td>50</td>
<td>0 (NA)</td>
<td>0 (5%)</td>
<td>$1.2 (9%)</td>
</tr>
<tr>
<td>One- or two-family dwelling</td>
<td>30</td>
<td>0 (NA)</td>
<td>0 (2%)</td>
<td>$0.4 (3%)</td>
</tr>
<tr>
<td>Apartment, tenement or flat</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.4 (3%)</td>
</tr>
<tr>
<td>Hotel, motel or inn</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (4%)</td>
<td>$0.3 (3%)</td>
</tr>
<tr>
<td>Storage property</td>
<td>30</td>
<td>0 (NA)</td>
<td>0 (4%)</td>
<td>$1.7 (13%)</td>
</tr>
<tr>
<td>General item storage</td>
<td>20</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.6 (4%)</td>
</tr>
<tr>
<td>Wood or paper product storage</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (2%)</td>
<td>$0.3 (3%)</td>
</tr>
<tr>
<td>Educational property</td>
<td>20</td>
<td>0 (NA)</td>
<td>0 (4%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Non-residential school through grade 12</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Basic industry, utility or defense property</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.3 (2%)</td>
</tr>
<tr>
<td>Non-metallic mineral or mineral product manufacture</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.0 (0%)</td>
</tr>
<tr>
<td>Special property</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Construction or unoccupied property</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (0%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td>Unclassified or unknown-type property use</td>
<td>10</td>
<td>0 (NA)</td>
<td>0 (1%)</td>
<td>$0.1 (1%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>630</td>
<td>0 (NA)</td>
<td>8 (100%)</td>
<td>$13.1 (100%)</td>
</tr>
</tbody>
</table>

Note: Sums may not equal totals due to rounding. All major occupancy categories are shown, as are subcategories that accounted for at least 1% or 10 of the fires (rounded to the nearest ten). Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire.

Source: NFIRS and NFPA survey.
Appendix A.
How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration’s (USFA’s) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association’s (NFPA’s) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit http://www.nfirs.fema.gov/. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.
NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.

NFPA’s fire department experience survey provides estimates of the big picture.
Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city departments are so few in number and protect such a large proportion of the total U.S. population that it
makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report Fire Loss in the United States. To download a free copy of the report, visit http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

Projecting NFIRS to National Estimates
As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

Scaling ratios are obtained by comparing NFPA’s projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA’s analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year’s release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.
From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

**NFPA survey projections**

**NFIRS totals (Version 5.0)**

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

Some analyses of structure fires show only non-confined fires. In these tables, percentages shown are of non-confined structure fires rather than all structure fires. This approach has the advantage of showing the frequency of specific factors in fire causes, but the disadvantage of possibly overstating the percentage of factors that are seldom seen in the confined fire incident types and of understating the factors specifically associated with the confined fire incident types.
Other analyses include entries for confined fire incident types in the causal tables and show percentages based on total structure fires. In these cases, the confined fire incident type is treated as a general causal factor.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.

In the formulas that follow, the term “all fires” refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

**Cause of Ignition:** This field is used chiefly to identify intentional fires. “Unintentional” in this field is a specific entry and does not include other fires that were not intentionally set: failure of equipment or heat source, act of nature, or “other” (unclassified).” The last should be used for exposures but has been used for other situations as well. Fires that were coded as under investigation and those that were coded as undetermined after investigation were treated as unknown.

**Factor Contributing to Ignition:** In this field, the code “none” is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for “not reported” when no factors are recorded. “Not reported” is treated as an unknown, but the code “none” is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Although Factor Contributing to Ignition is only required when the cause of ignition was coded as: 2) unintentional, 3) failure of equipment or heat source; or 4) act of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

In some analyses, all entries in the category of mechanical failure, malfunction (factor contributing to ignition 20-29) are combined and shown as one entry, “mechanical failure or malfunction.” This category includes:

21. Automatic control failure;
22. Manual control failure;
23. Leak or break. Includes leaks or breaks from containers or pipes. Excludes operational deficiencies and spill mishaps;
25. Worn out;
26. Backfire. Excludes fires originating as a result of hot catalytic converters;
27. Improper fuel used; Includes the use of gasoline in a kerosene heater and the like; and
20. Mechanical failure or malfunction, other.
Entries in “electrical failure, malfunction” (factor contributing to ignition 30-39) may also be combined into one entry, “electrical failure or malfunction.” This category includes:

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;
33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;
35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
36. Arc or spark from operating equipment, switch, or electric fence;
37. Fluorescent light ballast; and
38. Electrical failure or malfunction, other.

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: “Heat from open flame or smoking material, other.” NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

61. Cigarette;
62. Pipe or cigar;
63. Heat from undetermined smoking material;
64. Match;
65. Lighter: cigarette lighter, cigar lighter;
66. Candle;
67. Warning or road flare, fuse;
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11); and
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

\[
\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}
\]

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping “smoking materials” includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.
**Equipment Involved in Ignition (EII).** NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to “the piece of equipment that provided the principal heat source to cause ignition.” However, much of the data predates the change. Individuals who have already been trained with the older definition may not change their practices. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by

\[
\text{All fires} = \frac{(\text{All fires} – \text{blank} – \text{undetermined} – [\text{fires in which EII} = \text{NNN} \text{ and heat source} < 40-99])}{\text{All fires}}
\]

In addition, the partially unclassified codes for broad equipment groupings (i.e., code 100 - heating, ventilation, and air conditioning, other; code 200 - electrical distribution, lighting and power transfer, other; etc.) were allocated proportionally across the individual code choices in their respective broad groupings (heating, ventilation, and air conditioning; electrical distribution, lighting and power transfer, other; etc.). Equipment that is totally unclassified is not allocated further. This approach has the same downside as the allocation of heat source 60 described above. Equipment that is truly different is erroneously assigned to other categories.

In some analyses, various types of equipment are grouped together.

<table>
<thead>
<tr>
<th>Code Grouping</th>
<th>EII Code</th>
<th>NFIRS definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central heat</td>
<td>132</td>
<td>Furnace or central heating unit</td>
</tr>
<tr>
<td></td>
<td>133</td>
<td>Boiler (power, process or heating)</td>
</tr>
<tr>
<td>Fixed or portable space heater</td>
<td>131</td>
<td>Furnace, local heating unit, built-in</td>
</tr>
<tr>
<td></td>
<td>123</td>
<td>Fireplace with insert or stove</td>
</tr>
<tr>
<td></td>
<td>124</td>
<td>Heating stove</td>
</tr>
<tr>
<td></td>
<td>141</td>
<td>Heater, excluding catalytic and oil-filled</td>
</tr>
<tr>
<td></td>
<td>142</td>
<td>Catalytic heater</td>
</tr>
<tr>
<td></td>
<td>143</td>
<td>Oil-filled heater</td>
</tr>
<tr>
<td>Fireplace or chimney</td>
<td>120</td>
<td>Fireplace or chimney</td>
</tr>
<tr>
<td></td>
<td>121</td>
<td>Fireplace, masonry</td>
</tr>
<tr>
<td></td>
<td>122</td>
<td>Fireplace, factory-built</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Chimney connector or vent connector</td>
</tr>
<tr>
<td></td>
<td>126</td>
<td>Chimney – brick, stone or masonry</td>
</tr>
<tr>
<td></td>
<td>127</td>
<td>Chimney-metal, including stovepipe or flue</td>
</tr>
<tr>
<td>Fixed wiring and related equipment</td>
<td>210</td>
<td>Unclassified electrical wiring</td>
</tr>
<tr>
<td></td>
<td>211</td>
<td>Electrical power or utility line</td>
</tr>
<tr>
<td></td>
<td>212</td>
<td>Electrical service supply wires from utility</td>
</tr>
<tr>
<td></td>
<td>213</td>
<td>Electric meter or meter box</td>
</tr>
<tr>
<td></td>
<td>214</td>
<td>Wiring from meter box to circuit breaker</td>
</tr>
<tr>
<td></td>
<td>215</td>
<td>Panel board, switch board or circuit breaker board</td>
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<tr>
<td></td>
<td>216</td>
<td>Electrical branch circuit</td>
</tr>
<tr>
<td></td>
<td>217</td>
<td>Outlet or receptacle</td>
</tr>
<tr>
<td></td>
<td>218</td>
<td>Wall switch</td>
</tr>
<tr>
<td></td>
<td>219</td>
<td>Ground fault interrupter</td>
</tr>
<tr>
<td>Transformers and power supplies</td>
<td>221</td>
<td>Distribution-type transformer</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td>222</td>
<td>Overcurrent, disconnect equipment</td>
</tr>
<tr>
<td></td>
<td>223</td>
<td>Low-voltage transformer</td>
</tr>
<tr>
<td></td>
<td>224</td>
<td>Generator</td>
</tr>
<tr>
<td></td>
<td>225</td>
<td>Inverter</td>
</tr>
<tr>
<td></td>
<td>226</td>
<td>Uninterrupted power supply (UPS)</td>
</tr>
<tr>
<td></td>
<td>227</td>
<td>Surge protector</td>
</tr>
<tr>
<td></td>
<td>228</td>
<td>Battery charger or rectifier</td>
</tr>
<tr>
<td></td>
<td>229</td>
<td>Battery (all types)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lamp, bulb or lighting</th>
<th>230</th>
<th>Unclassified lamp or lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>231</td>
<td>Lamp-tabletop, floor or desk</td>
</tr>
<tr>
<td></td>
<td>232</td>
<td>Lantern or flashlight</td>
</tr>
<tr>
<td></td>
<td>233</td>
<td>Incandescent lighting fixture</td>
</tr>
<tr>
<td></td>
<td>234</td>
<td>Fluorescent light fixture or ballast</td>
</tr>
<tr>
<td></td>
<td>235</td>
<td>Halogen light fixture or lamp</td>
</tr>
<tr>
<td></td>
<td>236</td>
<td>Sodium or mercury vapor light fixture or lamp</td>
</tr>
<tr>
<td></td>
<td>237</td>
<td>Work or trouble light</td>
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<tr>
<td></td>
<td>238</td>
<td>Light bulb</td>
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<tr>
<td></td>
<td>241</td>
<td>Nightlight</td>
</tr>
<tr>
<td></td>
<td>242</td>
<td>Decorative lights – line voltage</td>
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<tr>
<td></td>
<td>243</td>
<td>Decorative or landscape lighting – low voltage</td>
</tr>
<tr>
<td></td>
<td>244</td>
<td>Sign</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Cord or plug</th>
<th>260</th>
<th>Unclassified cord or plug</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>261</td>
<td>Power cord or plug, detachable from appliance</td>
</tr>
<tr>
<td></td>
<td>262</td>
<td>Power cord or plug- permanently attached</td>
</tr>
<tr>
<td></td>
<td>263</td>
<td>Extension cord</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Torch, burner or soldering iron</th>
<th>331</th>
<th>Welding torch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>332</td>
<td>Cutting torch</td>
</tr>
<tr>
<td></td>
<td>333</td>
<td>Burner, including Bunsen burners</td>
</tr>
<tr>
<td></td>
<td>334</td>
<td>Soldering equipment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Portable cooking or warming equipment</th>
<th>631</th>
<th>Coffee maker or teapot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>632</td>
<td>Food warmer or hot plate</td>
</tr>
<tr>
<td></td>
<td>633</td>
<td>Kettle</td>
</tr>
<tr>
<td></td>
<td>634</td>
<td>Popcorn popper</td>
</tr>
<tr>
<td></td>
<td>635</td>
<td>Pressure cooker or canner</td>
</tr>
<tr>
<td></td>
<td>636</td>
<td>Slow cooker</td>
</tr>
<tr>
<td></td>
<td>637</td>
<td>Toaster, toaster oven, counter-top broiler</td>
</tr>
<tr>
<td></td>
<td>638</td>
<td>Waffle iron, griddle</td>
</tr>
<tr>
<td></td>
<td>639</td>
<td>Wok, frying pan, skillet</td>
</tr>
<tr>
<td></td>
<td>641</td>
<td>Breadmaking machine</td>
</tr>
</tbody>
</table>

Equipment was not analyzed separately for confined fires. Instead, each confined fire incident type was listed with the equipment or as other known equipment.
Item First Ignited. In most analyses, mattress and pillows (item first ignited 31) and bedding, blankets, sheets, and comforters (item first ignited 32) are combined and shown as “mattresses and bedding.” In many analyses, wearing apparel not on a person (code 34) and wearing apparel on a person (code 35) are combined and shown as “clothing.” In some analyses, flammable and combustible liquids and gases, piping and filters (item first ignited 60-69) are combined and shown together.

Area of Origin. Two areas of origin: bedroom for more than five people (code 21) and bedroom for less than five people (code 22) are combined and shown as simply “bedroom.” Chimney is no longer a valid area of origin code for non-confined fires.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.
APPENDIX D

SURVEY SUMMARY TABLE
<table>
<thead>
<tr>
<th>#</th>
<th>Age</th>
<th>Year</th>
<th>Occupancy</th>
<th>Use</th>
<th>Other Uses</th>
<th>Stories</th>
<th>Sprinkler System</th>
<th>Draftstopping Required</th>
<th>Draftstopping Provided</th>
<th>Draftstopping Material</th>
<th>Arrangement</th>
<th>Orientation to Trusses</th>
<th>Deficiencies</th>
<th>Penetration Protection</th>
<th>Joint Protection</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New</td>
<td>R-2</td>
<td>Apartment -</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>One split at each corridor and a split at every unit separation.</td>
<td>Parallel and Perpendicular</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>New</td>
<td>R-2</td>
<td>Apartment -</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>Split into 4 sectors, one on each end of the building with the middle portion split in half perpendicularly to the trusses</td>
<td>Parallel and Perpendicular</td>
<td>None</td>
<td>Firestopped</td>
<td>Fire jointed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>New</td>
<td>R-2</td>
<td>Apartment -</td>
<td>4</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>Along the corridor</td>
<td>Perpendicular</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>New</td>
<td>R-2</td>
<td>Apartment -</td>
<td>2</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>At every unit separation</td>
<td>Parallel</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>New</td>
<td>R-2</td>
<td>Apartment Parking - Ground Floor</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>One split at each corridor and every 2 units.</td>
<td>Parallel</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>New</td>
<td>R-2</td>
<td>Apartment Retail - Ground Floor</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Partial</td>
<td>Mostly plywood with some gypsum</td>
<td>Split into 4 equal sectors of 2,800 sq ft</td>
<td>Parallel</td>
<td>None</td>
<td>Firestopped</td>
<td>Fire jointed</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>New</td>
<td>R-2</td>
<td>Apartment -</td>
<td>4</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>One split at each corridor and every 2 units.</td>
<td>Parallel</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Existing</td>
<td>1998</td>
<td>R-2</td>
<td>Apartment -</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood and Gypsum</td>
<td>At every corridor wall and unit separation wall</td>
<td>Parallel</td>
<td>None</td>
<td>Firestopped</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Existing</td>
<td>2001</td>
<td>R-2</td>
<td>Apartment -</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood and Gypsum</td>
<td>At every corridor wall and unit separation wall</td>
<td>Parallel</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Existing</td>
<td>2002</td>
<td>R-2</td>
<td>Apartment -</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>At every corridor wall and unit separation wall</td>
<td>Parallel</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Existing</td>
<td>1993</td>
<td>R-2</td>
<td>Apartment -</td>
<td>2</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Gypsum</td>
<td>At every unit separation</td>
<td>Parallel</td>
<td>Damaged in one location only (has fallen out of place)</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Buildings had no corridors</td>
</tr>
<tr>
<td>12</td>
<td>Existing</td>
<td>1996</td>
<td>R-2</td>
<td>Apartment -</td>
<td>3</td>
<td>NFPA 13R</td>
<td>Yes</td>
<td>Yes</td>
<td>Gypsum</td>
<td>At every corridor wall and unit separation wall</td>
<td>Parallel and Perpendicular</td>
<td>1) Was not continuous around part of a roof at one location 2) Was not installed down into a ceiling soffit</td>
<td>Mud and Taped</td>
<td>Mud and Taped</td>
<td>Had minor deficiencies but was over designed and had penetration/joint protection</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Existing</td>
<td>1998</td>
<td>R-2</td>
<td>Hotel -</td>
<td>5</td>
<td>NFPA 13</td>
<td>No</td>
<td>Mostly</td>
<td>Plywood</td>
<td>Split into equal sectors of approximately 3,000 sq ft</td>
<td>Parallel</td>
<td>n/a</td>
<td>Yes</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Existing</td>
<td>2000</td>
<td>R-2</td>
<td>Hotel -</td>
<td>3</td>
<td>NFPA 13</td>
<td>No</td>
<td>Mostly</td>
<td>Plywood</td>
<td>Split into equal sectors of approximately 3,000 sq ft</td>
<td>Parallel</td>
<td>n/a</td>
<td>Firestopped</td>
<td>None</td>
<td>Some of the draftstopping was missing or never completed, mainly around the access openings.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Existing</td>
<td>1996</td>
<td>B</td>
<td>Business Clubhouse, offices, gym</td>
<td>1</td>
<td>none</td>
<td>Yes</td>
<td>Yes</td>
<td>Plywood</td>
<td>Split into equal sectors of approximately 3,000 sq ft</td>
<td>Parallel</td>
<td>1) Had access holes cut in them 2) Had large holes for penetrations</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Was a 10,000 sq ft clubhouse, had Terracotta roof</td>
</tr>
<tr>
<td>16</td>
<td>Existing</td>
<td>1996</td>
<td>B</td>
<td>Business Clubhouse</td>
<td>1</td>
<td>none</td>
<td>Yes</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Was a 5,000 sq ft clubhouse</td>
<td></td>
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<tr>
<td>17</td>
<td>Existing</td>
<td>2000</td>
<td>R-2</td>
<td>Hotel -</td>
<td>5</td>
<td>NFPA 13</td>
<td>No</td>
<td>Mostly</td>
<td>Plywood</td>
<td>Split into equal sectors of approximately 3,000 sq ft</td>
<td>Parallel</td>
<td>n/a</td>
<td>Firestopped</td>
<td>None</td>
<td>Type II construction with wired roof. The draftstopping had access openings but no self-closing doors.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>New</td>
<td>R-2</td>
<td>Apartment Parking Garage, Retail</td>
<td>5</td>
<td>NFPA 13</td>
<td>No</td>
<td>-</td>
<td>Only for interstitial sprinkler protection to 1,000 sq ft</td>
<td>Plywood</td>
<td>Only 18 inches deep</td>
<td>Parallel and Perpendicular</td>
<td>1) was not continuous in many areas 2) stopped short of adjacent draftstopping</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Construction Type was IIIB with fire-retardant-treated (FRT) wood exterior walls, had a concrete fire wall between adjacent parking garage, there was no FRT at the wall that faced the concrete fire wall.</td>
</tr>
</tbody>
</table>
Picture 02 – Typical Door in Plywood Draftstopping
Picture 03 – Typical Door in Plywood Draftstopping
Picture 04 – Draftstopping with both Plywood and Gypsum
Picture 05 – Gypsum Draftstopping with All Penetrations and Joints Sealed with Mud and Tape
Draftstopping Installed Perpendicular to the Trusses

Note how the trusses are in two sections.
Picture 07 – Draftstopping Installed Perpendicular to the Trusses
Note that the draftstopping stops about 2 ft from the attic floor and the access opening is not provided with a self-closing door.
Picture 09 – Building 11 Deficiency.

Note that the draftstopping has partially fallen out of place.
Picture 10 – Building 12 Deficiency.

Note that the draftstopping is not continuous around part of the roof.
Picture 11 – Building 12 Deficiency.

Note that the draftstopping is not installed down into a ceiling soffit.
Picture 12 – Building 12 Ceiling Soffit from Breezeway
Picture 13 – Building 15 Deficiency.

Note the hole cut for access and penetrations.
Picture 14 – Type III Construction with Exterior Walls of Fire-Retardant-Treated Wood Adjacent to Concrete Parking Garage
Picture 15 – Floor Terminating into Exterior Walls in Type III Construction with Exterior Walls of Fire-Retardant-Treated Wood at Concrete Fire Wall
Picture 16 – Draftstopping for Interstitial Sprinklers.

Note that the two sections stop short.
Picture 17 – Lightning Strike through Roof
Picture 18 – Lightning Strike in Wood Attic.

Note that this is post-fire with minor damage.
Picture 19 – Lightning Strike in Wood Attic.
APPENDIX F

RS MEANS COST DATA
<table>
<thead>
<tr>
<th>SHEATHING</th>
<th>Code</th>
<th>Daily Output</th>
<th>Labor Hours</th>
<th>Unit</th>
<th>Material</th>
<th>2013 Bare Costs</th>
<th>Total</th>
<th>Total Inc G&amp;R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plywood on roofs, CDX</td>
<td></td>
<td>2 Carp</td>
<td>1600</td>
<td>.010</td>
<td>S.F.</td>
<td>.55</td>
<td>.45</td>
<td>1</td>
</tr>
<tr>
<td>5/16&quot; thick</td>
<td></td>
<td></td>
<td>1952</td>
<td>.008</td>
<td></td>
<td>.55</td>
<td>.37</td>
<td>.92</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td>R0611G-20</td>
<td></td>
<td>1525</td>
<td>.010</td>
<td></td>
<td>.51</td>
<td>.47</td>
<td>.98</td>
</tr>
<tr>
<td>3/8&quot; thick</td>
<td></td>
<td></td>
<td>1080</td>
<td>.009</td>
<td></td>
<td>.51</td>
<td>.39</td>
<td>.90</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1400</td>
<td>.011</td>
<td></td>
<td>.50</td>
<td>.51</td>
<td>1.09</td>
</tr>
<tr>
<td>1/2&quot; thick</td>
<td></td>
<td></td>
<td>1708</td>
<td>.009</td>
<td></td>
<td>.58</td>
<td>.42</td>
<td>1</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1300</td>
<td>.012</td>
<td></td>
<td>.73</td>
<td>.55</td>
<td>1.28</td>
</tr>
<tr>
<td>5/8&quot; thick</td>
<td></td>
<td></td>
<td>1580</td>
<td>.010</td>
<td></td>
<td>.73</td>
<td>.45</td>
<td>1.18</td>
</tr>
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<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.77</td>
<td>.60</td>
<td>1.37</td>
</tr>
<tr>
<td>3/4&quot; thick</td>
<td></td>
<td></td>
<td>1440</td>
<td>.011</td>
<td></td>
<td>.77</td>
<td>.49</td>
<td>1.26</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.51</td>
<td>.60</td>
<td>1.11</td>
</tr>
<tr>
<td>Plywood on walls with exterior CDX, 3/8&quot; thick</td>
<td></td>
<td></td>
<td>1488</td>
<td>.011</td>
<td></td>
<td>.51</td>
<td>.48</td>
<td>.99</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1125</td>
<td>.014</td>
<td></td>
<td>.58</td>
<td>.64</td>
<td>1.22</td>
</tr>
<tr>
<td>1/2&quot; thick</td>
<td></td>
<td></td>
<td>1395</td>
<td>.011</td>
<td></td>
<td>.58</td>
<td>.52</td>
<td>1.10</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1050</td>
<td>.015</td>
<td></td>
<td>.73</td>
<td>.68</td>
<td>1.41</td>
</tr>
<tr>
<td>5/8&quot; thick</td>
<td></td>
<td></td>
<td>1302</td>
<td>.012</td>
<td></td>
<td>.73</td>
<td>.55</td>
<td>1.28</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>975</td>
<td>.016</td>
<td></td>
<td>.77</td>
<td>.74</td>
<td>1.51</td>
</tr>
<tr>
<td>3/4&quot; thick</td>
<td></td>
<td></td>
<td>1209</td>
<td>.013</td>
<td></td>
<td>.77</td>
<td>.59</td>
<td>1.36</td>
</tr>
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<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1400</td>
<td>.011</td>
<td></td>
<td>.57</td>
<td>.51</td>
<td>.88</td>
</tr>
<tr>
<td>Oriented strand b/d, 7/16&quot; thick</td>
<td></td>
<td></td>
<td>1736</td>
<td>.009</td>
<td></td>
<td>.37</td>
<td>.41</td>
<td>.78</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1325</td>
<td>.012</td>
<td></td>
<td>.37</td>
<td>.54</td>
<td>.91</td>
</tr>
<tr>
<td>1/2&quot; thick</td>
<td></td>
<td></td>
<td>1483</td>
<td>.010</td>
<td></td>
<td>.37</td>
<td>.44</td>
<td>.81</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td>1250</td>
<td>.013</td>
<td></td>
<td>.47</td>
<td>.57</td>
<td>1.04</td>
</tr>
<tr>
<td>5/8&quot; thick</td>
<td></td>
<td></td>
<td>1550</td>
<td>.010</td>
<td></td>
<td>.47</td>
<td>.46</td>
<td>.93</td>
</tr>
<tr>
<td>Pneumatic nailed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For shear wall construction, add:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For structural I exterior plywood, add:</td>
<td></td>
<td></td>
<td>2 Carp</td>
<td>.022</td>
<td>S.F.</td>
<td>1.80</td>
<td>.99</td>
<td>2.79</td>
</tr>
<tr>
<td>With bands, on roof 1&quot; x 6&quot; bands, laid horizontal</td>
<td></td>
<td></td>
<td>650</td>
<td>.025</td>
<td></td>
<td>1.80</td>
<td>1.11</td>
<td>2.91</td>
</tr>
<tr>
<td>Laid diagonal</td>
<td></td>
<td></td>
<td>675</td>
<td>.010</td>
<td></td>
<td>1.81</td>
<td>1.32</td>
<td>2.63</td>
</tr>
<tr>
<td>1&quot; x 8&quot; bands, laid horizontal</td>
<td></td>
<td></td>
<td>795</td>
<td>.022</td>
<td></td>
<td>1.81</td>
<td>.99</td>
<td>2.80</td>
</tr>
<tr>
<td>Laid diagonal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For steep roofs, add:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For dormers, hips and valley, add:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boards on walls, 1&quot; x 6&quot; boards, laid regular</td>
<td></td>
<td>2 Carp</td>
<td>650</td>
<td>.025</td>
<td></td>
<td>1.80</td>
<td>1.11</td>
<td>2.91</td>
</tr>
<tr>
<td>Laid diagonal</td>
<td></td>
<td></td>
<td>585</td>
<td>.027</td>
<td></td>
<td>1.80</td>
<td>1.23</td>
<td>3.03</td>
</tr>
<tr>
<td>1&quot; x 8&quot; boards, laid regular</td>
<td></td>
<td></td>
<td>765</td>
<td>.021</td>
<td></td>
<td>1.81</td>
<td>.94</td>
<td>2.75</td>
</tr>
<tr>
<td>Laid diagonal</td>
<td></td>
<td></td>
<td>650</td>
<td>.025</td>
<td></td>
<td>1.81</td>
<td>1.11</td>
<td>2.92</td>
</tr>
<tr>
<td>Gyproc, weatherproof, 1/2&quot; thick</td>
<td></td>
<td></td>
<td>1125</td>
<td>.014</td>
<td></td>
<td>.41</td>
<td>.64</td>
<td>.65</td>
</tr>
<tr>
<td>With embedded glass mats</td>
<td></td>
<td></td>
<td>1100</td>
<td>.015</td>
<td></td>
<td>.72</td>
<td>.65</td>
<td>1.37</td>
</tr>
<tr>
<td>Wood fiber, regular, no vapor barrier, 1/2&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.56</td>
<td>.60</td>
<td>1.16</td>
</tr>
<tr>
<td>5/8&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.71</td>
<td>.60</td>
<td>1.31</td>
</tr>
<tr>
<td>No vapor barrier, in colors, 1/2&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.68</td>
<td>.60</td>
<td>1.28</td>
</tr>
<tr>
<td>5/8&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.72</td>
<td>.60</td>
<td>1.32</td>
</tr>
<tr>
<td>With vapor barrier one side, white, 1/2&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.55</td>
<td>.60</td>
<td>1.15</td>
</tr>
<tr>
<td>Vapor barrier 2 sides, 1/2&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.77</td>
<td>.60</td>
<td>1.37</td>
</tr>
<tr>
<td>Asphalt impregnated, 25/32&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.30</td>
<td>.60</td>
<td>.90</td>
</tr>
<tr>
<td>Intermediate, 1/2&quot; thick</td>
<td></td>
<td></td>
<td>1200</td>
<td>.013</td>
<td></td>
<td>.22</td>
<td>.60</td>
<td>.82</td>
</tr>
</tbody>
</table>

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### 09 26 Veneer Plastering

#### 09 26 13.00 Blueboard

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Crew</th>
<th>Output</th>
<th>Labor Hours</th>
<th>Unit</th>
<th>2013 Base Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>For each strip high, add per story</td>
<td>65/0</td>
<td>6,100</td>
<td>0.009</td>
<td>S.F.</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

#### 09 26 13.80 Thin Coat Plaster

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Crew</th>
<th>Output</th>
<th>Labor Hours</th>
<th>Unit</th>
<th>2013 Base Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin Coat Plaster</td>
<td>61/0</td>
<td>3,600</td>
<td>0.11</td>
<td>S.F.</td>
<td>11</td>
<td>40</td>
</tr>
<tr>
<td>In 50 lb. bags</td>
<td>61/0</td>
<td>3,600</td>
<td>0.11</td>
<td>Bag</td>
<td>14.45</td>
<td>14.45</td>
</tr>
</tbody>
</table>

### 09 28 Backing Boards and Underlayments

#### 09 28 13.00 Cementitious Backerboard

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Crew</th>
<th>Output</th>
<th>Labor Hours</th>
<th>Unit</th>
<th>2013 Base Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cementitious backerboard, on floor, 3' x 4' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>525</td>
<td>0.030</td>
<td>S.F.</td>
<td>78</td>
<td>1.37</td>
</tr>
<tr>
<td>3' x 5' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>525</td>
<td>0.030</td>
<td>S.F.</td>
<td>73</td>
<td>1.37</td>
</tr>
<tr>
<td>3' x 6' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>525</td>
<td>0.030</td>
<td>S.F.</td>
<td>68</td>
<td>1.37</td>
</tr>
<tr>
<td>3' x 4' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>525</td>
<td>0.030</td>
<td>S.F.</td>
<td>97</td>
<td>1.37</td>
</tr>
<tr>
<td>3' x 5' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>525</td>
<td>0.030</td>
<td>S.F.</td>
<td>97</td>
<td>1.37</td>
</tr>
<tr>
<td>3' x 6' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>525</td>
<td>0.030</td>
<td>S.F.</td>
<td>88</td>
<td>1.37</td>
</tr>
<tr>
<td>3' x 4' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>350</td>
<td>0.046</td>
<td>S.F.</td>
<td>78</td>
<td>2.05</td>
</tr>
<tr>
<td>3' x 5' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>350</td>
<td>0.046</td>
<td>S.F.</td>
<td>73</td>
<td>2.05</td>
</tr>
<tr>
<td>3' x 4' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>350</td>
<td>0.046</td>
<td>S.F.</td>
<td>68</td>
<td>2.05</td>
</tr>
<tr>
<td>3' x 5' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>350</td>
<td>0.046</td>
<td>S.F.</td>
<td>97</td>
<td>2.05</td>
</tr>
<tr>
<td>3' x 6' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>350</td>
<td>0.046</td>
<td>S.F.</td>
<td>88</td>
<td>2.05</td>
</tr>
<tr>
<td>3' x 4' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>100</td>
<td>0.069</td>
<td>S.F.</td>
<td>78</td>
<td>3.99</td>
</tr>
<tr>
<td>3' x 5' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>100</td>
<td>0.069</td>
<td>S.F.</td>
<td>73</td>
<td>3.99</td>
</tr>
<tr>
<td>3' x 6' x 1/2&quot; sheets</td>
<td>07/0</td>
<td>100</td>
<td>0.069</td>
<td>S.F.</td>
<td>68</td>
<td>3.99</td>
</tr>
<tr>
<td>3' x 4' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>100</td>
<td>0.069</td>
<td>S.F.</td>
<td>97</td>
<td>3.99</td>
</tr>
<tr>
<td>3' x 5' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>100</td>
<td>0.069</td>
<td>S.F.</td>
<td>97</td>
<td>3.99</td>
</tr>
<tr>
<td>3' x 6' x 5/8&quot; sheets</td>
<td>07/0</td>
<td>100</td>
<td>0.069</td>
<td>S.F.</td>
<td>88</td>
<td>3.99</td>
</tr>
</tbody>
</table>

### 09 29 Gypsum Board

#### 09 29 10.00 Gypsum Board

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Crew</th>
<th>Output</th>
<th>Labor Hours</th>
<th>Unit</th>
<th>2013 Base Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gypsum Board on walls &amp; ceilings</td>
<td>00/0</td>
<td>2,000</td>
<td>0.008</td>
<td>S.F.</td>
<td>29</td>
<td>0.36</td>
</tr>
<tr>
<td>3/8&quot; thick, on walls, standard, no finish included</td>
<td>07/0</td>
<td>1800</td>
<td>0.009</td>
<td>S.F.</td>
<td>23</td>
<td>0.36</td>
</tr>
<tr>
<td>On ceilings, standard, no finish included</td>
<td>07/0</td>
<td>675</td>
<td>0.024</td>
<td>S.F.</td>
<td>23</td>
<td>1.03</td>
</tr>
<tr>
<td>On beams, columns, or shafts, no finish included</td>
<td>07/0</td>
<td>2000</td>
<td>0.008</td>
<td>S.F.</td>
<td>24</td>
<td>0.36</td>
</tr>
<tr>
<td>1/2&quot; thick, on walls, standard, no finish included</td>
<td>07/0</td>
<td>965</td>
<td>0.017</td>
<td>S.F.</td>
<td>29</td>
<td>0.74</td>
</tr>
<tr>
<td>Taped and finished (level 4 finish)</td>
<td>07/0</td>
<td>775</td>
<td>0.021</td>
<td>S.F.</td>
<td>34</td>
<td>0.93</td>
</tr>
<tr>
<td>With compound skim coat (level 5 finish)</td>
<td>07/0</td>
<td>2000</td>
<td>0.008</td>
<td>S.F.</td>
<td>27</td>
<td>0.36</td>
</tr>
<tr>
<td>Fire resistant, no finish included</td>
<td>07/0</td>
<td>965</td>
<td>0.017</td>
<td>S.F.</td>
<td>32</td>
<td>0.74</td>
</tr>
<tr>
<td>Taped and finished (level 4 finish)</td>
<td>07/0</td>
<td>775</td>
<td>0.021</td>
<td>S.F.</td>
<td>37</td>
<td>0.93</td>
</tr>
<tr>
<td>With compound skim coat (level 5 finish)</td>
<td>07/0</td>
<td>2000</td>
<td>0.008</td>
<td>S.F.</td>
<td>36</td>
<td>0.36</td>
</tr>
<tr>
<td>Water resistant, no finish included</td>
<td>07/0</td>
<td>965</td>
<td>0.017</td>
<td>S.F.</td>
<td>41</td>
<td>0.74</td>
</tr>
<tr>
<td>Taped and finished (level 4 finish)</td>
<td>07/0</td>
<td>775</td>
<td>0.021</td>
<td>S.F.</td>
<td>46</td>
<td>0.93</td>
</tr>
<tr>
<td>With compound skim coat (level 5 finish)</td>
<td>07/0</td>
<td>2000</td>
<td>0.008</td>
<td>S.F.</td>
<td>47</td>
<td>0.80</td>
</tr>
<tr>
<td>Prefinished, vinyl, clipped to studs</td>
<td>07/0</td>
<td>965</td>
<td>0.017</td>
<td>S.F.</td>
<td>38</td>
<td>0.36</td>
</tr>
<tr>
<td>Ablative resistant, no finish included</td>
<td>07/0</td>
<td>2000</td>
<td>0.008</td>
<td>S.F.</td>
<td>38</td>
<td>0.36</td>
</tr>
<tr>
<td>Taped and finished (level 4 finish)</td>
<td>07/0</td>
<td>965</td>
<td>0.017</td>
<td>S.F.</td>
<td>43</td>
<td>0.74</td>
</tr>
</tbody>
</table>
8.15.4 Alcohol-Based Hand-Rub Dispensers.
Where permitted by Chapters 15 through 31 and 33 through 34, alcohol-based hand-rub dispensers shall be permitted provided they meet all of the following criteria:

1. The maximum individual dispenser fluid capacity shall be as follows:
   2. 0.32 gal (1.2 L) for dispensers in corridors and areas open to corridors
   3. 0.53 gal (2.0 L) for dispensers in rooms or suites of rooms separated from corridors

Where aerosol containers are used, the maximum capacity of the aerosol dispenser shall be 18 oz. (0.51 kg) and shall be limited to Level 1 aerosols as defined in NFPA 30B, Code for the Manufacture and Storage of Aerosol Products.

Dispensers shall be separated from each other by horizontal spacing of not less than 48 in. (1220 mm).

Not more than an aggregate 10 gal (37.8 L) of alcohol-based hand-rub solution or 1135 oz (32.2 kg) of Level 1 aerosols, or a combination of liquids and Level 1 aerosols not to exceed, in total, the equivalent of 10 gal (37.8 L) or 1135 oz (32.2 kg,) shall be in use outside of a storage cabinet in a single smoke compartment, or fire compartment or story, whichever is less in area. One dispenser complying with 8.15.4 (1) per room and located in that room shall not be included in the aggregated quantity.

Storage of quantities greater than 5 gal (18.9 L) in a single smoke compartment or fire compartment or story, whichever is less in area, shall meet the requirements of NFPA 30, Flammable and Combustible Liquids Code .

Dispensers shall not be installed in the following locations:

9. Above an ignition source for a horizontal distance of 1 in. (25 mm) to each side of the ignition source
10. To the side of an ignition source within a 1 in. (25 mm) horizontal distance from the ignition source
11. Beneath an ignition source within a 1 in. (25 mm) vertical distance from the ignition source

Dispensers installed directly over carpeted floors shall be permitted only in sprinklered areas of the building.

The alcohol-based hand-rub solution shall not exceed 95 percent alcohol content by volume.

Operation of the dispenser shall comply with the following criteria:

15. The dispenser shall not release its contents except when the dispenser is activated, either manually or automatically by touch-free activation.
16. Any activation of the dispenser shall only occur when an object is placed within 4 in. (100 mm) of the sensing device.
17. An object placed within the activation zone and left in place shall not cause more than one activation.
18. The dispenser shall not dispense more solution than the amount required for hand hygiene consistent with label instructions.
(19) The dispenser shall be designed, constructed, and operated in a manner that ensures accidental or malicious activation of the dispensing device is minimized.

(20) The dispenser shall be tested in accordance with the manufacturer’s care and use instructions each time a new refill is installed.

Statement of Problem and Substantiation for Public Input

This building code does not seem to be the appropriate document to regulate the presence or placement of hand-sanitizer dispensers. Permits are not needed to install these devices. It seems better suited for a Fire Code or Existing Buildings Code.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 17:18:45 EDT 2015

Committee Statement

Resolution: This section covers those dispensing devices that can be fixed to the building wall or structure therefore addressed under the scope of NFPA 5000 (see permitting requirements.) ABHR dispensers are installed during the building construction and guidance is needed for their installation. The current requirement is important for both occupant safety and building protection, both addressed under the scope of NFPA 5000.
8.16.1.3

Any material that is subject to an increase in flame spread rating or smoke developed index beyond the limits herein established through the effects of age, moisture, or other atmospheric conditions shall not be permitted, unless such material complies with one of the following:

1. Duct and pipe insulation, coverings, and linings contained in plenums for buildings of all types of construction shall comply with the requirements of 7.2.3.2.15, NFPA 90A.
2. Foamed plastic insulation, other than duct and pipe insulation, coverings, and linings contained in plenums shall comply with Chapter 48.

Statement of Problem and Substantiation for Public Input

Section 7.2.3.2.15 does not exist in NFPA 5000.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 30 15:54:10 EDT 2015

Committee Statement

Resolution: FR-3504-NFPA 5000-2015
Statement: Section 7.2.3.2.15 does not exist in NFPA 5000 and the appropriate reference for duct and pipe insulation, coverings, and linings contained in plenums is to NFPA 90A.
9.1 Structures intended as children’s playgrounds, installed indoors and which exceed 10 ft (3.1 m) in height or 160 ft² (14.9 m²) in area, shall comply with the specifications in 9.1.1 through 9.1.4.

9.1.1 Indoor children’s playground structures shall be constructed of noncombustible materials or of combustible materials that comply with the following:

(1) Fire retardant–treated wood.

(2) Light-transmitting plastics complying with the requirements in 9.1.2.

(3) Foam plastics (including the pipe foam used in soft-contained play equipment structures) having a maximum heat-release rate not greater than 100 kW when tested in accordance with UL 1975 or NFPA 289, Standard Method of Fire Test for Individual Fuel Packages, using the 20 kW ignition source.

(4) Aluminum composite material (ACM) meeting the requirements of Class A interior finish in accordance with Chapter 10, when tested as an assembly in the maximum thickness intended for use.

(5) Textiles and films complying with the flame propagation performance criteria contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

(6) Plastic materials used to construct rigid components of soft-contained play equipment structures (such as tubes, windows, panels, junction boxes, pipes, slides, and decks) exhibiting a peak rate of heat release not exceeding 400 kW/m² when tested in accordance with ASTM E1354 at an incident heat flux of 50 kW/m² in the horizontal orientation at a thickness of 0.24 in. (6 mm).

(7) Balls used in ball pools, in soft-contained play equipment structures, shall have a maximum heat release rate not greater than 100 kW when tested in accordance with UL 1975 or NFPA 289 using the 20 kW ignition source.

The minimum specimen test size shall be 36 in. × 36 in. (0.91 m × 0.91 m) by an average of 21 in. (0.56 m) deep, and the balls shall be held in a box constructed of galvanized steel poultry netting wire mesh.

(8) Foam plastics shall be covered by a fabric, coating, or film meeting the flame propagation performance criteria contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.


9.1.2* Light-transmitting plastics used for children’s playgrounds shall meet all of the following criteria:

(1) They shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929.
They shall have a smoke developed index not greater than 450 when tested in the manner intended for use 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, or not greater than 75 when tested in the thickness intended for use in accordance with ASTM D2843, Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

(3) They shall meet the criteria of one of the following classifications:

(a) CC1 — Plastic materials that have a burn length of 1 in. (25 mm) or less and flame extinguishment when tested at a nominal thickness of 0.060 in. (1.5 mm), or in the thickness intended for use, in accordance with ASTM D635, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

(b) CC2 — Plastic materials that have a burning rate of 21/2 in./min (64 mm/min) or less when tested at a nominal thickness of 0.060 in. (1.5 mm), or at a thickness intended for use, in accordance with ASTM D635

9.1.3 Indoor children’s playground structures shall have a minimum horizontal separation from other structures of 20 ft (6.1 m).

9.1.4 Indoor children’s playground structures shall not exceed 300 ft² (28 m²) in area, unless approved by the AHJ.

A.9.1.2 The fire performance requirements for light-transmitting plastics can also be found in Chapter 48 of this Code.

Statement of Problem and Substantiation for Public Input

This section is copied (almost verbatim) from NFPA 1 section 10.19 because this should be in the building code as well as the fire code. The following changes have been made:

1. (editorial) Add ASTM E648 as an alternate option to NFPA 253 (same as in Chapter 10 of NFPA 5000).
2. (editorial) Correct a typographical error in NFPA 1 section 10.19.1.1 item 7 where it should read "heat flux of 50 kW/m², in the horizontal orientation" and spurious, and unnecessary, words appear in NFPA 1.
3. (editorial) Refer to Chapter 10 of NFPA 5000 instead of Chapter 10 of NFPA 101, since the proposed text would go into NFPA 5000 and both sections are equivalent.
4. (editorial) Refer to Chapter 48 in this code (meaning NFPA 5000) in the proposed annex note.
5. (technical) Change the requirements in 10.19.1 from structures that exceed a height "and" a width to ones that exceed "either a height or a width", because experience indicates that proposals have been made for structures that are very tall but do not exceed the mandated width. Those structures should meet the requirements and they would, presently, not need to meet them.

Public inputs will also be made to NFPA 1 to make the changes in 1, 2 and 5.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address:
**Committee Statement**

**Resolution:** The material is in NFPA 1 and that is where it belongs. Play items like balls - that can be brought in to a facility after it receives its certificate of occupancy - should not be addressed by NFPA 5000. If the material were to be addressed in NFPA 5000, the maximum 300 sq ft limitation is not reasonable.
10.2 *

Interior Finish

10.2.1

General

10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available, unless otherwise provided in 10.2.1.2.

10.2.1.2 The provisions of 10.2.1.1 shall not apply to:

- Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

- Lockers constructed of combustible materials shall be considered interior finish.

10.2.2 * Use of Interior Finishes.

10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:

(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34

(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2 * Interior floor finish shall comply with 10.2.6 under any of the following conditions:

(1) Where floor finish requirements are specified elsewhere in this Code

(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent
to floor finishes with a critical radiant flux of at least 0.1 W/cm².

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.

When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286. Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard for Test for Surface Burning Characteristics of Building Materials, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

10.2.3.4 Materials complying with the requirements of Section 10.2.3.1 shall not be required to be tested in accordance with 10.2.3.3.
10.2.3.5 Materials described in sections 10.2.4 shall be tested as described in the corresponding sections.

10.2.3.6 * Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.2.3.7 * 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.
10.2.4 * Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 shall not apply to materials having a total thickness of less than $\frac{1}{28}$ 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.

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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.
Fixed or movable walls and partitions, paneling, and wall pads and crash pads, applied structurally or for decoration, acoustical correction, surface insulation, or other purposes, shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.5

Lockers constructed of combustible materials shall be considered interior finish.

10.2.4.3.1.1 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 10,764 ft$^2$ (1000 m$^2$)]

3. ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*


10.2.4.3.1.2 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.

10.2.4.3.1.3 *Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, or FM 4880, *Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coating, and Exterior Wall Systems*, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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/ft$^3$ (320 kg/m$^3$) in density, is limited to 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1 *Products tested in accordance with 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*, shall comply with the criteria of 10.2.4.4.2.
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, Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls:

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. The total smoke released throughout the test shall not exceed 10,764 ft² (1000 m²).

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 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or
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 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 shall be permitted on the ceilings of rooms or areas protected by an approved automatic sprinkler system.

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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or
(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 for Test 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 shall be permitted on the ceilings of rooms or areas protected by an approved automatic sprinkler system.

10.2.4.8 Lockers.

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 Polypropylene (PP) and High-Density Polyethylene (HDPE). Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 Site-Fabricated Stretch Systems. 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 10.2.3.3. 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 E2573, Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics.

10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).
10.2.4.13 **Laminated products factory-produced with a wood substrate**. 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. 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.

10.2.4.14 **Facings or wood veneers intended to be applied on site over a wood substrate**. 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* **Light transmitting plastics**. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 **Bulletin Boards and Posters.**

10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.


10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of $0.1 \text{ W/cm}^2$.


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than $0.45 \text{ W/cm}^2$, as determined by the test described in 10.2.6.3.

10.2.6.4.2 Class II Interior Floor Finish. Class II interior floor finish shall have a critical radiant flux of not less than $0.22 \text{ W/cm}^2$, but less than $0.45 \text{ W/cm}^2$, as determined by the test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 Automatic Sprinklers.

10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. It also incorporates sections 10.3 through 10.8, to make it fully parallel to NFPA 101. The attachments show the way the sections will read if approved by the committee. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements. As proposed in separate public inputs, new sections are proposed to be added dealing with "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

Note where the links to the annex should move:
10.2: to stay with 10.2
10.3.2: to go to 10.2.2
10.3.2.2: to go to 10.2.2.2
10.4.1: to go to 10.2.3.1
10.4.1.3: to go to 10.2.3.6
10.4.1.4: to go to 10.2.3.7
10.4.2: to go to 10.2.3.3
10.4.5 to go to 10.2.4.4
10.4.5.1 to go to 10.2.4.4.1
10.5 to go to 10.2.4
10.5.1 to go to 10.2.4.4
10.5.2 to go to 10.2.4.5
10.5.3.1.3 to go to 10.2.4.3.1.3
10.5.4 to go to 10.2.4.15
10.7 to go to 10.2.6
10.7.1 to go to 10.2.6.1
10.7.2 to go to 10.2.6.2
10.7.3 to go to 10.2.6.3

Related Public Inputs for This Document

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Submitter Information Verification

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Submittal Date: Sun Jun 21 19:29:29 EDT 2015

Committee Statement

Resolution: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.
New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to address the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish

10.2.1 General

10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.

10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.

When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286.

Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

**10.2.3.3.1** 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.

**10.2.3.3.2** Wherever the use of Class C interior wall and ceiling finish is required, Class A or Class B shall be permitted. Where Class B interior wall and ceiling finish is required, Class A shall be permitted.

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

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

**10.2.3.6** Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this *Code*.

**10.2.3.7** 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
**Materials or Coating, and Exterior Wall Systems**, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

**10.2.4.3.2** 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/ft\(^3\) (320 kg/m\(^3\)) in density, is limited to 1/2 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.

**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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

**10.2.4.4.1** Products tested in accordance with 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*, shall comply with the criteria of 10.2.4.4.2.

**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, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*:

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. The total smoke released throughout the test shall not exceed 10,764 ft\(^2\) (1000 m\(^2\)).

**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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

**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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

10.2.4.8 **Lockers.**

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 **Polypropylene (PP) and High-Density Polyethylene (HDPE).** Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 **Site-Fabricated Stretch Systems.** 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 10.2.3.3. 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 E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*.
10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 Laminated products factory-produced with a wood substrate. 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. 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.

10.2.4.14 Facings or wood veneers intended to be applied on site over a wood substrate. 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. If the materials are tested in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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.

10.2.4.15* Light transmitting plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.4.2 Class II Interior Floor Finish. Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 Automatic Sprinklers.
10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
10.2* Interior Finish

10.2.1 General

10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available, unless otherwise provided in 10.2.1.2.

10.2.1.2 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:
- The wall or ceiling surface is a noncombustible or limited combustible material.
- The materials applied meet the requirements of Class A interior wall or ceiling finish when tested in accordance with 10.4.1, using fiber cement board as the substrate material.

10.2.1.3 If a material having a total thickness of less than 1/28 in. (0.9 mm) is applied to a surface that is not noncombustible or not limited-combustible, the provisions of 10.2.1.1 shall apply.

10.2.1.4 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.5 Lockers constructed of combustible materials shall be considered interior finish.

10.3 Use of Interior Finishes.

10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
- Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
- As specified in section 10.2.3 through 10.2.5.

10.2.2.2 Use of Interior Finishes

10.2.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
- Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
- As specified in section 10.2.3 through 10.2.5.

10.2.2.2 Interior floor finish shall comply with 10.2.6 under any of the following conditions:
- Where floor finish requirements are specified elsewhere in this Code
- Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.
When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

**10.2.3.1 Interior wall and ceiling finish materials tested in accordance with NFPA 286.** Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

**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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 1,000 m².

**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 E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

**10.2.3.3.1 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.**

**10.2.3.3.2 Wherever the use of Class C interior wall and ceiling finish is required, Class A or Class B shall be permitted. Where Class B interior wall and ceiling finish is required, Class A shall be permitted.**

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

**10.2.3.5 Materials described in sections 10.2.4 shall be tested as described in the corresponding sections.**
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.14 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with NFPA 220, Standard on Types of Building Construction, or with the building code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1* 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.

10.2.4.3.1.1 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

10.2.4.3.1.2* 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.

10.2.4.3.1.3 Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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/ft\(^3\) (320 kg/m\(^3\)) in density, is limited to 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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, shall comply with the criteria of 10.2.4.4.2.

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, Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls:

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. \(\times\) 12 ft. (2440 mm \(\times\) 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 m\(^2\).

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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:

(1) comply with the requirements of the requirements of section 10.2.3.1 or
(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 for Test 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 shall be permitted on the ceilings of rooms or areas protected by an approved automatic sprinkler system.

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 either:

(1) comply with the requirements of the requirements of section 10.2.3.1 or
(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 for Test 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 shall be permitted on the ceilings of rooms or areas protected by an approved automatic sprinkler system.

10.2.4.8 Polypropylene (PP) and High-Density Polyethylene (HDPE). Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.9 Site-Fabricated Stretch Systems. 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 10.2.3.3. 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 E2573, Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics.

10.2.4.10 Reflective Insulation Materials. Reflective insulation materials 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. 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 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.
10.2.4.11 **Metal Ceiling and Wall Panels.** 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.12 **Laminated products factory-produced with a wood substrate.** 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. 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.

10.2.4.13 **Facings or wood veneers intended to be applied on site over a wood substrate.** 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.14* **Light transmitting plastics.** Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. *(See Section 48.7.)*

10.4 **Interior Wall or Ceiling Finish Testing and Classification.**

10.4.1* **Interior wall or ceiling finish that is required elsewhere in this Code to be Class A, Class B, or Class C shall be classified based on test results from 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, except as indicated in 10.4.1.1 or 10.4.1.2.**

10.4.1.1 Exposed portions of structural members complying with the requirements for Type IV(2HH) construction in accordance with 7.2.5 of this Code shall be exempt from testing and classification 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*. 

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10.4.1.2 Interior wall and ceiling finish tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, and meeting the conditions of 10.4.5.2 shall be permitted to be used where interior wall and ceiling finish is required to be Class A 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*.

10.4.1.3* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.4.1.4* 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.

10.4.2* Products required to be 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*, shall be grouped in the classes described in 10.4.2.1 through 10.4.2.3 in accordance with their flame spread index and smoke developed index, except as indicated in 10.4.1.2.

10.4.2.1 Class A Interior Wall and Ceiling Finish. Class A interior wall and ceiling finishes shall be those finishes with a flame spread index of 0–25 and a smoke developed index of 0–450 and shall include any material classified at 25 or less on the flame spread index test scale and 450 or less on the smoke developed index test scale.

10.4.2.2 Class B Interior Wall and Ceiling Finish. Class B interior wall and ceiling finishes shall be those finishes with a flame spread index of 26–75 and a smoke developed index of 0–450 and shall include any material classified at more than 25 but not more than 75 on the flame spread index test scale and 450 or less on the smoke developed index test scale.

10.4.2.3 Class C Interior Wall and Ceiling Finish. Class C interior wall and ceiling finishes shall be those finishes with a flame spread index of 76–200 and a smoke developed index of 0–450 and shall include any material classified at more than 75 but not more than 200 on the flame spread index test scale and 450 or less on the smoke developed index test scale.

10.4.3 The classification of interior finish specified in 10.4.2 shall be that of the basic material used by itself or in combination with other materials.

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

10.4.5* Products tested in accordance with 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*, shall comply with the criteria of 10.4.5.1. Products tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, shall comply with the criteria of 10.4.5.2.
10.4.5.1* The interior finish shall comply with all of the following when tested using method B of the test protocol 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:
(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) The total smoke released throughout the test shall not exceed 1000 m$^2$.

10.4.5.2 The interior finish shall comply with all of the following when tested using the test protocol of NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth:
(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) The total smoke released throughout the test shall not exceed 1000 m$^2$.

10.5* Specific Materials:
10.5.1* Textile Wall and Textile Ceiling Materials. The use of textile materials on walls or ceilings shall comply with one of the following conditions:
(1) 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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, to Assess Surface Burning Characteristics (see 10.4.2), shall be permitted on the walls or ceilings of rooms or areas protected by an approved automatic sprinkler system.
(2) Textile materials meeting the requirements of Class A when tested in accordance with ASTM E84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E 2404 (see 10.3.2), shall be permitted 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) Textile materials meeting the requirements of Class A when tested in accordance with ASTM E84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E2404 (see 10.3.2), shall be permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions.
(4) Textile materials shall be permitted on walls and partitions where tested in accordance with 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. (See 10.3.5)
(5) Textile materials shall be permitted on walls, partitions, and ceilings 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. (See 10.3.5)
10.5.2* Expanded Vinyl Wall and Expanded Vinyl Ceiling Materials. The use of expanded vinyl wall or expanded vinyl ceiling materials shall comply with one of the following conditions:

(1) 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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, to Assess Surface Burning Characteristics (see 10.4.2), shall be permitted on the walls or ceilings of rooms or areas protected by an approved automatic sprinkler system.

(2) Materials meeting the requirements of Class A when tested in accordance with ASTM E84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E2404 (see 10.3.2), shall be permitted 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) Materials meeting the requirements of Class A when tested in accordance with ASTM E84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E2404 (see 10.3.2), shall be permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions.

(4) Materials shall be permitted on walls and partitions where tested in accordance with 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. (See 10.3.6)

(5) Materials shall be permitted on walls, partitions, and ceilings 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. (See 10.3.5)

10.5.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.5.3.1 or 10.5.3.2. This subsection shall apply both to exposed foamed plastics and to foamed plastics used in conjunction with a textile or vinyl facing or cover.

10.5.3.1* 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.

10.5.3.1.1 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 10.4.5.2

(2) ANSI/UL 1715, Standard for Fire Test of Interior Finish Material (including smoke measurements, with total smoke release not to exceed 1000 m³)

(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction


10.5.3.1.2 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.
10.5.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.4.5.2.

10.5.3.2 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/ft$^3$ (320 kg/m$^3$) in density, is limited to 1/2 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 10.4.2; however, the smoke developed index shall not be limited.

10.5.4* Light-Transmitting Plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light-transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

10.5.5 Metal Ceiling and Wall Panels. Listed factory-finished metal ceiling and wall panels 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 for Test for Surface Burning Characteristics of Building Materials (see 10.4.2), shall be permitted to be finished with one additional application of paint. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.5.6 Lockers.
10.5.6.1 Combustible Lockers. Where lockers constructed of combustible materials other than wood are used, the lockers shall be considered interior finish and shall comply with Section 10.2, except as permitted by 10.5.6.2.
10.5.6.2 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 10.4.1.

10.5.7 Polypropylene (PP) and High-Density Polyethylene (HDPE). Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.4.5.2. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.5.8 Site-Fabricated Stretch Systems. 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 10.4.1 or 10.4.1.2. 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.
10.5.9 Reflective Insulation Materials. Reflective insulation materials shall be tested in the manner intended for use and shall comply with the requirements of 10.4.1 or 10.4.2. 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 E 2599, 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.

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 10.6.2 and bulletin boards and posters in accordance with 10.2.5.3 10.6.3, 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 10.2.6.4 10.7.4 using the test described in 10.2.6.3 10.7.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.

10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6 Interior Floor Finish Testing and Classification.


10.2.6.2 Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.
10.2.6.4.1 **Class I Interior Floor Finish.** Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm$^2$, as determined by the test described in 10.2.6.3 10.7.3.

10.2.6.4.2 **Class II Interior Floor Finish.** Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm$^2$, but less than 0.45 W/cm$^2$, as determined by the test described in 10.2.6.3 10.7.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 **Automatic Sprinklers.**

10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 10.7.2 shall apply.

10.2.8* **Fire retardant coatings**

10.2.8.1 Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this *Code.*

10.2.8.2* 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.
10.3 – Use of Interior Finishes.

10.3.1 –
Requirements for interior wall and ceiling finish shall apply as follows:

(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34.

(2) As specified in Section 10.5.

10.3.2 – Use of Interior Finishes.

10.3.2.1 –
Requirements for interior wall and ceiling finish shall apply as follows:

(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34.

(2) As specified in Section 10.4 through 10.6.

10.3.2.2 –
Interior floor finish shall comply with Section 10.7 under any of the following conditions:

(1) Where floor finish requirements are specified elsewhere in this Code.

(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm².

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

This section, as well as sections 10.4 through 10.8 are proposed to be eliminated and incorporated into section 10.2, for parallelism with NFPA 101 (no change in requirements).

Related Public Inputs for This Document

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Submitter Information Verification
Resolution:

Statement: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, textile or expanded vinyl wall coverings are only allowed to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.
10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish
10.2.1 General
10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.
10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.
When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286. Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard for Test for Surface Burning Characteristics of Building Materials, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

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

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

10.2.3.6* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.2.3.7* 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
10.2.4.3.2 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/ft$^3$ (320 kg/m$^3$) in density, is limited to 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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*, shall comply with the criteria of 10.2.4.4.2.

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, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*:

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. The total smoke released throughout the test shall not exceed 10,764 ft$^2$ (1000 m$^2$).

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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:
(1) comply with the requirements of the requirements of section 10.2.3.1 or
(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 for Test 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 shall be permitted on the ceilings of rooms or areas protected by an approved automatic sprinkler system.

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 either:
(1) comply with the requirements of the requirements of section 10.2.3.1 or
(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 for Test 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 shall be permitted on the ceilings of rooms or areas protected by an approved automatic sprinkler system.

10.2.4.8 Lockers.
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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 Polypropylene (PP) and High-Density Polyethylene (HDPE). Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 Site-Fabricated Stretch Systems. 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 10.2.3.3. 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 E2573, Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics.
10.2.4.11 **Reflective Insulation Materials.** Reflective insulation materials 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. 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 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*.

10.2.4.12 **Metal Ceiling and Wall Panels.** 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 **Laminated products factory-produced with a wood substrate.** 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. 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.

10.2.4.14 **Facings or wood veneers intended to be applied on site over a wood substrate.** 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* **Light transmitting plastics.** Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (*See Section 48.7.*)

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.4.2 Class II Interior Floor Finish. Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 Automatic Sprinklers.
10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
10.4 – Interior Wall or Ceiling Finish Testing and Classification.

10.4.1 – Interior wall or ceiling finish that is required elsewhere in this Code to be Class A, Class B, or Class C shall be classified based on test results from ASTM E 84, Standard Test Method of Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard for Test of Surface Burning Characteristics of Building Materials, or except as indicated in 10.4.1.1 or 10.4.1.2.

10.4.1.1 – Exposed portions of structural members complying with the requirements for Type IV(2HH) construction in accordance with 7.2.5 of this Code shall be exempt from the testing and classification provisions of ASTM E 84 or ANSI/UL 723.

10.4.1.2 – Interior wall and ceiling finish tested in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and meeting the conditions of 10.4.5.2, shall be permitted to be used where a Class A classification in accordance with ASTM E 84 or ANSI/UL 723 is required.

10.4.1.3 – Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.4.1.4 – 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 E 2768, Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials, on the coated surface.

10.4.2 – Products required to be tested in accordance with ASTM E 84 or ANSI/UL 723 shall be grouped in the classes described in 10.4.2.1 through 10.4.2.3 in accordance with their flame spread index and smoke developed index, except as indicated in 10.4.1.2.

10.4.2.1 – Class A Interior Wall and Ceiling Finish.

Class A interior wall and ceiling finishes shall be those finishes with a flame spread index of 0–25 and a smoke developed index of 0–450 and shall include any material classified at 25 or less on the flame spread index test scale and 450 or less on the smoke developed index test scale.

10.4.2.2 – Class B Interior Wall and Ceiling Finish.

Class B interior wall and ceiling finishes shall be those finishes with a flame spread index of 26–75 and a smoke developed index of 0–450 and shall include any material classified at more than 25 but not more than 75 on the flame spread index test scale and 450 or less on the smoke developed index test scale.
10.4.2.3 - Class C Interior Wall and Ceiling Finish.

Class C interior wall and ceiling finishes shall be those finishes with a flame spread index of 76–200 and a smoke developed index of 0–450 and shall include any material classified at more than 75 but not more than 200 on the flame spread index test scale and 450 or less on the smoke developed index test scale.

10.4.3 -

The classification of interior finish specified in 10.4.2 shall be that of the basic material used by itself or in combination with other materials.

10.4.4 -

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

10.4.5* -

Products tested in accordance with 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, shall comply with the criteria of 10.4.5.1. Products tested in accordance with NFPA 286 shall comply with the criteria of 10.4.5.2.

10.4.5.1* -

The interior finish shall comply with the following when tested using the Method B test protocol 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:

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 by 12 ft (2440 mm by 3660 mm) walls.
3. Flashover, as described in NFPA 265, shall not occur.
4. The total smoke released throughout the test shall not exceed 1000 m$^2$.

10.4.5.2 -

The interior finish shall comply with all of the following when tested using the test protocol of NFPA 286:

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. The total smoke released throughout the test shall not exceed 10,764 ft$^2$ (1000 m$^2$).

Additional Proposed Changes

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<th>Description</th>
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<td>Proposed complete 10.2.</td>
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Statement of Problem and Substantiation for Public Input

This section, as well as sections 10.3 and 10.4 through 10.8 are proposed to be eliminated and incorporated into section 10.2, for parallelism with NFPA 101 (no change in requirements).

Related Public Inputs for This Document

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<td>Public Input No. 53-NFPA 5000-2015 [Section No. 10.2]</td>
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Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
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Submittal Date: Sun Jun 21 19:39:13 EDT 2015

Committee Statement

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10.2.1.3 (revision): The text “constructed of combustible material” was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish
10.2.1 General
10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.
10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.
When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286. Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

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

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

10.2.3.6* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this *Code*.

10.2.3.7* 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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/ft$^3$ (320 kg/m$^3$) in density, is limited to 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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, shall comply with the criteria of 10.2.4.4.2.

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, Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls:

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. The total smoke released throughout the test shall not exceed 10,764 ft$^2$ (1000 m$^2$).

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 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

10.2.4.8 **Lockers.**

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 **Polypropylene (PP) and High-Density Polyethylene (HDPE).** Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 **Site-Fabricated Stretch Systems.** 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 10.2.3.3. 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 E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*. 

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10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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*.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 Laminated products factory-produced with a wood substrate. 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. 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.

10.2.4.14 Facings or wood veneers intended to be applied on site over a wood substrate. 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* Light transmitting plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a
Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 **Bulletin Boards and Posters.**
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or
18.6.5.

10.2.6* **Interior Floor Finish Testing and Classification.**
10.2.6.1* Carpet and carpet like interior floor finishes shall comply with ASTM D2859,
*Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering
Materials.*

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for
fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².

10.2.6.3* Interior floor finishes shall be classified in accordance with 10.2.6.4, based on test
results from NFPA 253, *Standard Method of Test for Critical Radiant Flux of Floor
Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy
Source.*

10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and
10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 **Class I Interior Floor Finish.** Class I interior floor finish shall have a critical
radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.4.2 **Class II Interior Floor Finish.** Class II interior floor finish shall have a critical
radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the
test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor
finish shall be permitted.

10.2.7 **Automatic Sprinklers.**
10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
10.5.9 Laminated products factory-produced with a wood substrate. Laminated products factory-produced with a wood substrate shall be tested in the manner intended for use and shall comply with the requirements of 10.4. 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 (see 10.4.2), 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.

Statement of Problem and Substantiation for Public Input

ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

Note that this public input is not intended to replace an existing section but to be incorporated after the last section in 10.5. Note also that the public input to add a clarification of the requirements for facings or wood veneers intended to be applied on site over a wood substrate is also intended to be incorporated as a new section between.

NFPA 286 language
5.8 Wall or Ceiling Covering Materials.
5.8.2 Where the wall or ceiling covering system is a factory produced wall panel, the adhesive shall be the same one used in the manufacture of the factory-produced wall or ceiling panel.

ASTM E2579 - Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics
1. Scope
1.1 This practice describes procedures for specimen preparation and mounting when testing wood products to assess flame spread and smoke development as surface burning characteristics using Test Method E84.
1.2 This practice applies also to laminated products factory produced with a wood substrate (see 8.6). This practice does not apply to wood veneers or facings intended to be applied on site over a wood substrate, which are covered by Practice E2404.
1.3 Testing is conducted with Test Method E84.

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
1. Scope
1.1 This practice describes procedures for specimen preparation and mounting when testing textile,
paper or polymeric (including vinyl and expanded vinyl) wall or ceiling covering materials to assess flame spread and smoke development as surface burning characteristics using Test Method E84.

1.2 This practice applies also to facings or wood veneers intended to be applied on site over a wood substrate (see 8.7). This practice does not apply to laminated products factory produced with a wood substrate, which are covered by Practice E2579.

1.3 Testing is conducted with Test Method E84.

Related Public Inputs for This Document

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Submitter Information Verification

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Submittal Date: Thu Jun 11 18:01:13 EDT 2015

Committee Statement

Resolution: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is...
that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.5.10 Facings or wood veneers intended to be applied on site over a wood substrate. 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 10.4. If the materials are tested in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth (see 10.4.x), they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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 (see 10.4.x), 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.

Statement of Problem and Substantiation for Public Input

ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory-produced and have a wood substrate. The concept is that these facings (applied on site) are basically the same as wall coverings and the manufacturer should be responsible for the facing only and needs to ensure that the material is safe and should test over the appropriate substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a non-combustible substrate. Therefore the requirement in ASTM E2404 is that the testing be done over a standard wood substrate and, thus, there will no need to retest for different types of wood.

Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Panels including factory applied facings with wood substrates are tested using ASTM E2579.

Note that this public input is not intended to replace an existing section but to be incorporated at the end of the 10.5 sections. Note also that the public input to add a clarification of the requirements for laminated products factory-produced with a wood substrate is also intended to be incorporated as a new section within 10.4.

NFPA 286 language
5.9 Laminated Products with Wood Substrates.
5.9.1 Laminated products shall be tested as they are intended to be installed.
5.9.1.1 The test specimens shall consist of the finished product, namely the combination of the facing or veneer, the adhesives or fasteners used, and the specific wood substrate that will be used.
5.9.2 If the laminated product consists of a facing or veneer intended to be applied on-site over a wood substrate, the facing or veneer shall be tested as described in 5.9.2.1 and 5.9.2.2.
5.9.2.1* The test specimens shall comply with the following:
(1) Specimens shall consist of the facing or veneer mounted on the "A" face of nominal 12 mm (15/32 in.) untreated plywood with a face veneer of Douglas fir.
(2) The plywood shall comply with NIST Voluntary Product Standard PS 1, Structural Plywood.
(3) The plywood shall carry one of the following grade stamps: (a) APA-The Engineered Wood Association (b) TECO, indicating that the plywood has been graded PS 1 A-B and is for exterior exposure (c) CSA Standard O121, Douglas Fir Plywood.
5.9.2.2 The adhesive used to attach the facing or veneer to the wood substrate in 5.9.2.1 shall be that specified by the manufacturer of the facing or veneer and applied in accordance with manufacturer's application instructions.

Also, for information, from NFPA 286:
5.8.9 Wall or Ceiling Coverings Intended to Be Applied over a Wood Substrate. If the wall or ceiling coverings are intended to be applied over a wood substrate, the specimens shall consist of the wall or ceiling covering mounted on untreated plywood, with a face veneer of Douglas fir. The plywood shall have the same thickness as the wood substrate used in actual installations, and shall comply with NIST Voluntary Product Standard PS 1-07, Structural Plywood. The plywood shall be marked with a grade stamp indicating that the plywood has been graded PS 1-07 A-B and is for exterior exposure. The grade stamp shall be issued by a quality control agency. Alternatively, the plywood shall be permitted to be stamped as conforming to CSA Standard O121, Douglas Fir Plywood.

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
1. Scope
1.1 This practice describes procedures for specimen preparation and mounting when testing textile, paper or polymeric (including vinyl and expanded vinyl) wall or ceiling covering materials to assess flame spread and smoke development as surface burning characteristics using Test Method E84.
1.2 This practice applies also to facings or wood veneers intended to be applied on site over a wood substrate (see 8.7). This practice does not apply to laminated products factory produced with a wood substrate, which are covered by Practice E2579.
1.3 Testing is conducted with Test Method E84.

ASTM E2579 - Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics
1. Scope
1.1 This practice describes procedures for specimen preparation and mounting when testing wood products to assess flame spread and smoke development as surface burning characteristics using Test Method E84.
1.2 This practice applies also to laminated products factory produced with a wood substrate (see 8.6). This practice does not apply to wood veneers or facings intended to be applied on site over a wood substrate, which are covered by Practice E2404.
1.3 Testing is conducted with Test Method E84.

Related Public Inputs for This Document

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<td>Public Input No. 53-NFPA 5000-2015 [Section No. 10.2]</td>
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Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
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Zip: 
Submittal Date: Thu Jun 11 18:11:24 EDT 2015
Committee Statement

Resolution:
Statement: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a
more user friendly and comprehensive set of provisions. Table A.10.2, which was
developed to summarize the interior finish provisions is no longer needed. New language
summarizing the organization of 10.2 has been added. The annex sections are also
being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is
obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.5 Specific Materials

10.5.1 Textile Wall and Textile Ceiling Materials

The use of textile materials on walls or ceilings shall comply with one of the following conditions:

1. Textile materials meeting the requirements of Class A when tested in accordance with ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard for Test for Surface Burning, using the specimen preparation and mounting method of ASTM E 2404, Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (including Vinyl) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, to Assess Surface Burning Characteristics (see 10.4.2), shall be permitted on the walls or ceilings of rooms or areas protected by an approved automatic sprinkler system.

2. Textile materials meeting the requirements of Class A when tested in accordance with ASTM E 84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E 2404 (see 10.3.2), shall be permitted 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. Textile materials meeting the requirements of Class A when tested in accordance with ASTM E 84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E 2404 (see 10.3.2), shall be permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions.

4. Textile materials shall be permitted on walls and partitions where tested in accordance with 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 (See 10.3.5.)

5. Textile materials shall be permitted on walls, partitions, and ceilings 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 (See 10.3.5.)
10.5.2 - Expanded Vinyl Wall and Ceiling Coverings.

The use of expanded vinyl wall or ceiling coverings shall comply with one of the following conditions:

1. Materials meeting the requirements of Class A when tested in accordance with ASTM E 84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E 2404 (see 10.4.2), shall be permitted on the walls or ceilings of rooms or areas protected by an approved automatic sprinkler system.

2. Materials meeting the requirements of Class A when tested in accordance with ASTM E 84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E 2404 (see 10.3.2), shall be permitted 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. Materials meeting the requirements of Class A when tested in accordance with ASTM E 84 or ANSI/UL 723, using the specimen preparation and mounting method of ASTM E 2404 (see 10.3.2), shall be permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions.

4. Materials shall be permitted on walls and partitions where tested in accordance with 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. (See 10.3.6.)

5. Materials shall be permitted on walls, partitions, and ceilings 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. (See 10.3.5.)

10.5.3 - Cellular or Foamed Plastic.

Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish, unless specifically permitted by 10.5.3.1 or 10.5.3.2. This subsection shall apply to both exposed foamed plastics and to foamed plastics used in conjunction with a textile or vinyl facing or cover.

10.5.3.1 -

Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate the combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.5.3.1.1 -

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 10.4.5.2

2. ANSI/UL 1715, Standard for Fire Test of Interior Finish Material (including smoke measurements, with total smoke release not to exceed 10,764 ft² (1000 m²))

3. ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

4. FM 4880, Approval Standard for Class 1 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
10.5.3.1.2

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.

10.5.3.1.3

Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, or FM 4880, *Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coating, and Exterior Wall Systems*, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.4.5.2.

10.5.3.2

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/ft$^3$ (320 kg/m$^3$) in density, is limited to 1\(\frac{1}{2}\) 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 10.4.2; however, the smoke developed index shall not be limited.

10.5.4

*Light-Transmitting Plastics.*

Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light-transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

10.5.5

*Metal Ceiling and Wall Panels.*

Listed, factory-finished metal ceiling and wall panels meeting the requirements of Class A when tested in accordance with ASTM E 84 or ANSI/UL 723 (see 10.4.2) shall be permitted to be finished with one additional application of paint. These painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed \(\frac{1}{28}\) in. (0.90 mm).

10.5.6

*Lockers.*

10.5.6.1

*Combustible Lockers.*

Where lockers constructed of combustible materials other than wood are used, the lockers shall be considered interior finish and shall comply with Section 10.2, except as permitted by 10.5.6.2.

10.5.6.2

*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 10.4.4.

10.5.7

*Polypropylene (PP) and High Density Polyethylene (HDPE).*

Polypropylene and high density polyethylene materials shall not be permitted to be used as interior wall or ceiling finish, unless the material complies with the requirements of 10.4.5.2. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.
10.5.8 Site-Fabricated Stretch Systems.

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 10.4.1 or 10.4.1.2. If the materials are tested in accordance with ASTM E 84 or ANSI/UL 723, specimen preparation and mounting shall be in accordance with ASTM E 2573.

10.5.9 Reflective Insulation Materials.

Reflective insulation materials shall be tested in the manner intended for use and shall comply with the requirements of 10.4.1 or 10.4.1.2. If the materials are tested in accordance with ASTM E 84 or ANSI/UL 723, specimen preparation and mounting shall be in accordance with ASTM E 2599, 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.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

This section, as well as sections 10.3, 10.4 and 10.6 through 10.8 are proposed to be eliminated and incorporated into section 10.2, for parallelism with NFPA 101 (no change in requirements).

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
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Street Address: 
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Submittal Date: Sun Jun 21 19:40:45 EDT 2015

Committee Statement

Resolution:
Statement: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP
are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to address the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.
A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish
10.2.1 General
10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.
10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.
When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286.
Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

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

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

10.2.3.6* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.2.3.7* 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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/ft\(^3\) (320 kg/m\(^3\)) in density, is limited to 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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, shall comply with the criteria of 10.2.4.4.2.

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, Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls:

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. The total smoke released throughout the test shall not exceed 10,764 ft\(^2\) (1000 m\(^2\)).

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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

10.2.4.8 **Lockers.**

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 **Polypropylene (PP) and High-Density Polyethylene (HDPE).** Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 **Site-Fabricated Stretch Systems.** 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 10.2.3.3. 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 E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*. 
10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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*.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 Laminated products factory-produced with a wood substrate. 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. 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.

10.2.4.14 Facings or wood veneers intended to be applied on site over a wood substrate. 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* Light transmitting plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.4.2 Class II Interior Floor Finish. Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 Automatic Sprinklers.
10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
10.6 Trim and Incidental Finish.

10.6.1 General.
Interior wall and ceiling trim and incidental finish, other than wall base in accordance with 10.6.2 and bulletin boards and posters in accordance with 10.6.3, 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.

10.6.2 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 interior wall finish requirements for its location or the requirements for Class II interior floor finish, as described in 10.7.4, using the test described in 10.7.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.6.3 Bulletin Boards and Posters.

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

10.6.3.2 The provision of 10.6.3.1 shall not apply to artwork and teaching materials in sprinklered educational or day-care occupancies in accordance with 17.5.5.3, 18.5.5, or 18.6.5.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

This section, as well as sections 10.3 through 10.5 and 10.7 through 10.8 are proposed to be eliminated and incorporated into section 10.2, for parallelism with NFPA 101 (no change in requirements).

Related Public Inputs for This Document

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<td>Public Input No. 53-NFPA 5000-2015 [Section No. 10.2]</td>
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Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Resolution: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish

10.2.1 General

10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.

10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.

When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286.

10.2.3.1 Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

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

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

10.2.3.6* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this *Code*.

10.2.3.7* 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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, shall comply with the criteria of 10.2.4.4.2.

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, Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls:

(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) The total smoke released throughout the test shall not exceed 10,764 ft² (1000 m²).

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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

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 either:

1. comply with the requirements of the requirements of section 10.2.3.1 or

10.2.4.8 **Lockers.**

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 **Polypropylene (PP) and High-Density Polyethylene (HDPE).** Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 **Site-Fabricated Stretch Systems.** 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 10.2.3.3. 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 E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*. 
10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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*.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 Laminated products factory-produced with a wood substrate. 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. 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.

10.2.4.14 Facings or wood veneers intended to be applied on site over a wood substrate. 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* Light transmitting plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. (See Section 48.7.)

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.4.2 Class II Interior Floor Finish. Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 Automatic Sprinklers.
10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
10.7 - Interior Floor Finish Testing and Classification


10.7.2 - Floor coverings, other than carpet for which 10.3.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.7.4 - Interior floor finishes shall be grouped in the classes specified in 10.7.4.1 and 10.7.4.2 in accordance with the critical radiant flux requirements.

10.7.4.1 - Class I Interior Floor Finish.

Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.7.3.

10.7.4.2 - Class II Interior Floor Finish.

Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the test described in 10.7.3.

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Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

This section, as well as sections 10.3 through 10.6 and section 10.8 are proposed to be eliminated and incorporated into section 10.2, for parallelism with NFPA 101 (no change in requirements).

Related Public Inputs for This Document

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Committee Statement

Resolution: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.
10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish
10.2.1 General
10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.
10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.
When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286.
Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard for Test for Surface Burning Characteristics of Building Materials, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

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

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

10.2.3.6* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.2.3.7* 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
**Materials or Coating, and Exterior Wall Systems** shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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*, shall comply with the criteria of 10.2.4.4.2.

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, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*:

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. The total smoke released throughout the test shall not exceed 10,764 ft² (1000 m²).

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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:
(1) comply with the requirements of the requirements of section 10.2.3.1 or

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 either:
(1) comply with the requirements of the requirements of section 10.2.3.1 or

10.2.4.8 **Lockers.**

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 **Polypropylene (PP) and High-Density Polyethylene (HDPE).** Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 **Site-Fabricated Stretch Systems.** 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 10.2.3.3. 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 E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*. 
10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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*.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 Laminated products factory-produced with a wood substrate. 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. 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.

10.2.4.14 Facings or wood veneers intended to be applied on site over a wood substrate. 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* Light transmitting plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. *(See Section 48.7.)*

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 and posters 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 10.2.6.4 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


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10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

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10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
10.8 – Automatic Sprinklers

10.8.1 –
Other than as required in Section 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

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Where an approved automatic sprinkler system is installed in accordance with Section 55.3 throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required; and where Class II is required, the provisions of 10.7.2 shall apply.

Additional Proposed Changes

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Committee Statement

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10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also
being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
10.2* Interior Finish
10.2.1 General
10.2.1.1 Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations, provided that the authority having jurisdiction is permitted to establish the classification of any material for which a classification by a standard test is not available.

10.2.1.2 Fixed or movable walls and partitions, paneling, wall pads, and crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and shall not be considered decorations or furnishings.

10.2.1.3 Lockers constructed of combustible materials shall be considered interior finish.

10.2.2* Use of Interior Finishes.
10.2.2.1 Requirements for interior wall and ceiling finish shall apply as follows:
(1) Where specified elsewhere in this Code for specific occupancies as noted in Chapter 11 and Chapters 15 through 31 and 33 through 34
(2) As specified in section 10.2.3 through 10.2.5.

10.2.2.2* Interior floor finish shall comply with 10.2.6 under any of the following conditions:
(1) Where floor finish requirements are specified elsewhere in this Code
(2) Where the fire performance of the floor finish cannot be demonstrated to be equivalent to floor finishes with a critical radiant flux of at least 0.1 W/cm²

10.2.3 Interior Wall or Ceiling Finish Testing and Classification.
When interior wall or ceiling finish is required elsewhere in this Code to be classified for fire performance and smoke development it shall be classified in accordance with 10.2.3.1 or 10.2.3.3, except as indicated in sections 10.2.4.

10.2.3.1* Interior wall and ceiling finish materials tested in accordance with NFPA 286. Interior wall and ceiling finish materials shall be classified in accordance with NFPA 286, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, and comply with Section 10.2.3.2. Materials tested in accordance with section 10.2.3.1 and complying with Section 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 Section 10.2.3.3.

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 defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 10,764 ft² (1,000 m²).

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 E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, except as indicated in Sections 10.2.3.4 and 10.2.3.5. Such interior finish materials 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.

10.2.3.3.1 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.

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

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

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

10.2.3.6* Fire-retardant coatings shall not be used to obtain compliance with the interior finish requirements of this Code.

10.2.3.7* 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.
10.2.4* Interior wall and ceiling finish materials with special requirements. The materials indicated in Sections 10.2.4.1 through 10.2.4.15 shall be tested as indicated in the corresponding sections.

10.2.4.1 Thickness exemption.

10.2.4.1.1 The provisions of 10.2.3 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.

10.2.4.1.2 If a material having a total thickness of less than 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.

10.2.4.2 Exposed portions of structural members. Exposed portions of structural members complying with the requirements for Type IV (2HH) construction in accordance with 7.2.5 of this code shall be exempt from testing and classification in accordance with 10.2.3.

10.2.4.3 Cellular or Foamed Plastic. Cellular or foamed plastic materials shall not be used as interior wall and ceiling finish unless specifically permitted by 10.2.4.3.1 or 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.

10.2.4.3.1 Cellular or foamed plastic materials meeting the definition of foamed plastic insulation shall be permitted where subjected to large-scale fire tests that substantiate their combustibility and smoke release characteristics of the material for the use intended under actual fire conditions.

10.2.4.3.1.1 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 10,764 ft² (1000 m²)]
(3) ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction

10.2.4.3.1.2 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.

10.2.4.3.1.3* Cellular or foamed plastic materials tested in accordance with ANSI/UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish
Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of 10.2.3.2.

10.2.4.3.2 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/ft$^3$ (320 kg/m$^3$) in density, is limited to 1/2 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.

10.2.4.4.1* Products tested in accordance with 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, shall comply with the criteria of 10.2.4.4.2.

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, Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls:

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. The total smoke released throughout the test shall not exceed 10,764 ft$^2$ (1000 m$^2$).

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 for Test 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) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, 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.

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 one of the following: section 10.2.3.1, section 10.2.4.4.1 or section 10.2.4.4.3.
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 either:

(1) comply with the requirements of the requirements of section 10.2.3.1 or

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 either:

(1) comply with the requirements of the requirements of section 10.2.3.1 or

10.2.4.8 Lockers.

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 Section 10.2.3, except as permitted by 10.4.8.2.

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.

10.2.4.9 Polypropylene (PP) and High-Density Polyethylene (HDPE). Polypropylene and high-density polyethylene materials shall not be permitted as interior wall or ceiling finish unless the material complies with the requirements of 10.2.3.1. The tests shall be performed on a finished assembly and on the maximum thickness intended for use.

10.2.4.10 Site-Fabricated Stretch Systems. 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 10.2.3.3. 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 E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics*. 

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10.2.4.11 Reflective Insulation Materials. Reflective insulation materials 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. 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 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*.

10.2.4.12 Metal Ceiling and Wall Panels. 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. Such painted panels shall be permitted for use in areas where Class A interior finishes are required. The total paint thickness shall not exceed 1/28 in. (0.9 mm).

10.2.4.13 Laminated products factory-produced with a wood substrate. 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. 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.

10.2.4.14 Facings or wood veneers intended to be applied on site over a wood substrate. 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. If the materials are tested in accordance with NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, they shall use the product-mounting system, including adhesive, described in Section 5.8.9 of NFPA 286. 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*.

10.2.4.15* Light transmitting plastics. Light-transmitting plastics used as interior wall and ceiling finish shall be permitted based on large-scale fire tests that substantiate the combustibility characteristics of the plastics for the use intended under actual fire conditions. The tests shall be performed on a light transmitting plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use. *(See Section 48.7.)*

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 and posters 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 10.2.6 using the test described in 10.2.6.3. If a Class I floor finish is required, the interior floor trim shall be Class I.

10.2.5.3 Bulletin Boards and Posters.
10.2.5.3.1 Bulletin boards and posters 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 17.5.5.3, 18.5.5 or 18.6.5.

10.2.6* Interior Floor Finish Testing and Classification.

10.2.6.2* Floor coverings, other than carpet for which 10.2.2.2 establishes requirements for fire performance, shall have a minimum critical radiant flux of 0.1 W/cm².


10.2.6.4 Interior floor finishes shall be grouped in the classes specified in 10.2.6.4.1 and 10.2.6.4.2 in accordance with the critical radiant flux requirements.

10.2.6.4.1 Class I Interior Floor Finish. Class I interior floor finish shall have a critical radiant flux of not less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.4.2 Class II Interior Floor Finish. Class II interior floor finish shall have a critical radiant flux of not less than 0.22 W/cm², but less than 0.45 W/cm², as determined by the test described in 10.2.6.3.

10.2.6.5 Wherever the use of Class II interior floor finish is required, Class I interior floor finish shall be permitted.

10.2.7 Automatic Sprinklers.
10.2.7.1 Other than as required in 10.5, where an approved automatic sprinkler system is installed in accordance with Section 55.3, Class C interior wall and ceiling finish materials shall be permitted in any location where Class B is required, and Class B interior wall and ceiling finish materials shall be permitted in any location where Class A is required.

10.2.7.2 Where an approved automatic sprinkler system is installed in accordance with Section 55.3, throughout the fire compartment or smoke compartment containing the interior floor finish, Class II interior floor finish shall be permitted in any location where Class I interior floor finish is required, and where Class II is required, the provisions of 10.2.6.2 shall apply.
11.1.5.1
Means of egress shall be designed and maintained to provide headroom in accordance with other sections of this Code, and such headroom shall be not less than 7 ft 6 in. (2285 mm) with projections. Projections from the ceiling shall provide a headroom of not less than 6 ft 8 in. (2030 m), with a tolerance of $\frac{3}{4}$ in. ($-19$ mm) above the finished floor.

Statement of Problem and Substantiation for Public Input

Breaking the provision into separate sentences fixes the descriptive error in the text. The tolerance is deleted because the ADA requirement is for 6 ft. 8 in. headroom.

Submitter Information Verification

Submitter Full Name: Jim Muir
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Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 17:23:37 EDT 2015

Committee Statement

Resolution: The ADA includes some "absolute" dimensional criteria (such as this absolute minimum 6 ft - 8 in. headroom criterion) that cannot be justified technically. The 3/4 in. tolerance is needed to accommodate the doorstop on a 6 ft 8 in. door. NFPA 5000 is also used in numerous countries in which the ADA does not apply. The tolerance needs to remain an option.
Every door opening and every principal entrance that is required to serve as an exit shall be designed and constructed so that the **path** of egress travel is obvious and direct. Windows that, because of their physical configuration or design and the materials used in their construction, have the potential to be mistaken for door openings shall be made inaccessible to the occupants by barriers or railings.

Statement of Problem and Substantiation for Public Input

The change from “way” to “path” is consistent with design terminology. The last sentence is deleted because it is superfluous. Perhaps this sentence is more appropriate for Annex A.

Submitter Information Verification

Submitter Full Name: Jim Muir
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State: 
Zip: 
Submittal Date: Sat Jul 04 17:27:39 EDT 2015

Committee Statement

Resolution: Text is adequate and the second sentence is not superfluous.
11.2.1.1.3.1
For the purposes of Section 11.2.1.1.3.2, a building shall be considered to be occupied at any
time it meets any of the following criteria:
(1) It is open for general occupancy.
(2) It is open to the public.
(3) It is occupied by more than 10 persons.

Statement of Problem and Substantiation for Public Input

This provision applies to all egress components as written. It is intended to only apply to very special
cases like when a retail space is closing with a security grill. This change will clarify that the provision
is intended for the very specific provision in 11.2.1.1.3.2.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 17:30:38 EDT 2015

Committee Statement

Resolution: Provision applies to all of Sec. 11.2, especially the provisions for key operated locks.
**Public Input No. 131-NFPA 5000-2015 [ Section No. 11.2.1.3.2 ]**

### 11.2.1.3.2

The elevation of the floor surfaces required by 11.2.1.3.1 shall be maintained on both sides of the door openings for a distance not less than the width of the widest leaf and not less than 36 inches.

---

**Statement of Problem and Substantiation for Public Input**

For smaller door leafs the minimum of 36 inches on both sides of the door accommodates an adult gate.

---

**Submitter Information Verification**

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- **Organization:** Building Safety Division, Clark County, Washington
- **Affiliation:** NFPA's Building Code Development Committee (BCDC)
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Sat Jul 04 17:33:13 EDT 2015

---

**Committee Statement**

- **Resolution:** FR-6001-NFPA 5000-2015
- **Statement:** For smaller door leafs the minimum of 36 inches on both sides of the door accommodates an adult gait.
11.2.1.4.2 Door Leaf Swing Direction.

Side-hinged or pivoted-swinging door leaves in the required means of egress shall swing in the direction of egress travel where any of the following conditions exist:

1. The door assemblies shall serve an area with an occupant load of 50 or more.
2. The door assemblies shall be used in an exit enclosure.
3. The requirement of 11.2.1.4.2 (2) shall not apply to door assemblies from individual dwelling units that open directly into an exit enclosure.
4. The door assemblies shall serve a high hazard contents area.

A.11.2.1.4.2 See 11.4.2.1.2 and 11.4.2.2.2 for door swing direction requirements for working spaces about electrical equipment.

Statement of Problem and Substantiation for Public Input

The proposed Annex note serves as an advisory pointer to the new provisions of 11.4.2.1.2 and 11.4.2.2.2.

Related Public Inputs for This Document

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<td>Advisory pointer</td>
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</table>

Submitter Information Verification

Submitter Full Name: WILLIAM KOFFEL
Organization: KOFFEL ASSOCIATES INC
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 26 12:18:55 EDT 2015

Committee Statement

Resolution: FR-6003-NFPA 5000-2015
Statement: The annex text serves as an advisory pointer to the new provisions in 11.4.2.1.2 and 11.4.2.2.2.
11.2.1.5.3
Locks, if provided, shall not require the use of a key, a tool, or special knowledge or effort for operation from the egress side.

11.2.1.3.1 In Educational and Business Educational occupancies and where approved by the authority having jurisdiction, classroom doors shall be allowed to be provided with locking arrangements designed to keep intruders from entering the room when all of the following conditions are met:

1. The door shall be capable of being unlocked from outside the room with a key or other approved means.
2. Modifications shall not be made to existing listed panic hardware, fire door hardware or door closers.
3. Modifications to fire door assemblies shall be in accordance with NFPA 80.

Statement of Problem and Substantiation for Public Input

Reason Statement:
Many jurisdictions have taken measures to address the high priority concern of safety of occupants in K-12 classrooms and college campuses in the event of a threatening situation. While well-intended and likely to have a degree of positive impact, these actions create disparate requirements from jurisdiction to jurisdiction, and some actions may inadvertently compromise certain aspects of life safety while attempting to address others.

This proposal provides requirements which balance the challenges of providing protection for students and teachers in the classroom with that of free and immediate egress at all times without use of keys, tools, or special knowledge. In addition to the security concerns, classroom doors are required to meet accessibility requirements which include door operating hardware configuration and location, door hardware operational forces, and a smooth surface of the bottom 10" of the push side of the door. Door locksets with "classroom security function" are readily available today at the same cost as traditionally-used "classroom function" door locksets. The most common configuration of a classroom security function lockset is the ability to lock the door from inside the classroom with a key preventing entry to the classroom; and for egress, the door may be unlatched and opened from inside the classroom without a key by rotating the lever handle. On the outside of the classroom, consistent with tradition, the door may be locked with a key, and unlocked and opened with a key. This code change proposal will require all Group E classroom doors to be lockable from the inside of the classroom preventing entry to the classroom, without the need to open the door. This proposal does not prescribe specifically how the door is to be lockable from inside the classroom. Additional requirements are the door is to be unlockable and readily openable inside the classroom without the use of a key or special knowledge or effort, as required in IBC Section 1010.1.9. Subsections of 1010.1.9 include requirements for hardware height (between 34 and 48 inches above the floor), and for hardware configuration (for doors required to be accessible, which would be almost all classroom doors, the door operating hardware shall not require tight grasping, tight pinching or twisting of the wrist to operate). An additional requirement of this proposal is the classroom door is to be unlockable and openable from outside the classroom by a key or other listed device.

Submitter Information Verification
Committee Statement

Resolution: The TC on Means of Egress would be working outside its scope to write occupancy specific provisions. The occupancy committees are expected to draft related language. The committee will wait for the correlating committee to ask for its involvement.
11.2.1.7 – Panic Hardware and Fire Exit Hardware.

A. 11.2.1.7 See 11.4.2.1.2 and 11.4.2.2.2 for door panic hardware/fire exit hardware requirements for working space about electrical equipment.

11.2.1.7.1

Where a door assembly is required to be equipped with panic hardware or fire exit hardware, such hardware shall meet all of the following criteria:

(1) It shall consist of a cross bar or push pad, the actuating portion of which extends across not less than one-half of the width of the door leaf.

(2) It shall be mounted not less than 34 in. (865 mm), and not more than 48 in. (1220 mm), above the floor.

(3) It shall be constructed so that a horizontal force not to exceed 15 lbf (67 N) actuates the cross bar or push pad and latches.

11.2.1.7.2

Only approved fire exit hardware shall be used on fire protection–rated door assemblies.

11.2.1.7.2.1

Panic hardware and fire exit hardware shall comply with ANSI/UL 305, Standard for Safety Panic Hardware, and ANSI/BHMA A156.3, Exit Devices.

11.2.1.7.3

Required panic hardware and fire exit hardware in other than detention and correctional occupancies, as otherwise provided in 21.2.11, shall not be equipped with any locking device, set screw, or other arrangement that prevents the release of the latch when pressure is applied to the releasing device.

11.2.1.7.4

Devices that hold the latch in the retracted position shall be prohibited on fire exit hardware, unless listed and approved for that purpose.

Statement of Problem and Substantiation for Public Input

The proposed Annex note will serve as an advisory pointer to the new provisions of 11.4.2.1.2 and 11.4.2.2.2.

Related Public Inputs for This Document

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<tr>
<td>Public Input No. 25-NFPA 5000-2015 [Section No. 11.4.2]</td>
<td>Advisory pointer</td>
</tr>
</tbody>
</table>

Submitter Information Verification

Submitter Full Name: WILLIAM KOFFEL
Organization: KOFFEL ASSOCIATES INC

Page 395 of 863
Committee Statement

Statement: The annex serves as an advisory pointer to the new provisions of 11.4.2.1.2 and 11.4.2.2.2.
11.2.1.9.2 Self-Closing or Self-Latching Door Leaf Operation.

Where door leaves are required to be self-closing or self-latching and are operated by power upon the approach of a person, or are provided with power-assisted manual operation, they shall be permitted in the means of egress under the following conditions:

1. Door leaves can be opened manually in accordance with 11.2.1.9.1 to allow egress travel in the event of power failure.

2. Door leaves remain in the closed position, unless actuated or opened manually.

3. When actuated, door leaves remain open for not more than 30 seconds.

4. Door leaves held open for any period of time close leaves are required to close — and the power-assist mechanism must cease to function — upon operation of approved smoke detectors installed in such a way as to detect smoke on either side of the door opening in accordance with the provisions of NFPA 72.

5. Door leaves required to be self-latching are either self-latching or become self-latching upon operation of approved smoke detectors per 11.2.1.9.2 (4).


Statement of Problem and Substantiation for Public Input

This item was confusing as written. The revised language clarifies the intent.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 17:36:19 EDT 2015

Committee Statement

Resolution: The input eliminates the parallel structure of the numbered list without improving anything.
11.2.1.10.4

The requirement of 11.2.1.10.3 shall not apply to revolving door wings, provided that the collapsing force is reduced to a force not to exceed 130 lbf (580 N) under all of the following conditions:

1. Power failure, or removal of power to the device holding the wings in position
2. Actuation of the automatic sprinkler system, where such a system is provided
3. Actuation of a smoke detection system that is installed to provide coverage in all areas within the building that are within 75 ft (23 m) of the revolving door assemblies
4. Actuation of a clearly identified manual control switch in an approved location that reduces the holding force to a force not to exceed 130 lbf (580 N)

Statement of Problem and Substantiation for Public Input

This revision corrects a grammatical error.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 17:40:15 EDT 2015

Committee Statement

Resolution: FR-6002-NFPA 5000-2015
Statement: This revision corrects a grammatical error.
Public Input No. 187-NFPA 5000-2015 [Section No. 11.2.2.1.2]

11.2.2.1.2 Reserved.

Modify 11.2.2.1.2 as follows:

11.2.2.1.2 Emergency Stair Travel Devices

11.2.2.1.2.1 Number and Location.

11.2.2.1.2.1.1 All buildings that are two stories or more above grade and that are accessed by the public for goods and services shall have an emergency stair travel device on each floor at each stairway.

11.2.2.1.2.1.2 There shall be one additional emergency stair travel device provided for each employee who will need to use one in an evacuation. These devices shall be located in the employee’s office or at the nearest stair to the employee’s office at their discretion.

11.2.2.1.2.2 All devices shall comply with ANSI/RESNA ED-1: 2013.

11.2.2.1.2.3 Storage cabinets for such devices shall not be permitted to be locked at any time.

11.2.2.1.2.4 One manual wheelchair shall be located at each stairway at the floor of discharge and available, without requiring the user to have a key or special knowledge, such that a user of an emergency stair travel device can be transferred to the manual wheelchair to travel from the stairway at the floor of discharge to the outside.

11.2.2.1.2.5 All members of the emergency planning team and all personnel who will be occupants or operators of the device shall be trained at least once each year on using the device and transferring those who may need to use the device in an emergency.

Additional Proposed Changes

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<tr>
<td>RESNA_Position_Paper_Evac_Chairs.pdf</td>
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</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Input

Emergency stair travel devices are now covered by a performance standard (ANSI/RESNA ED-1:2013), and the availability of these devices will greatly increase the safety of individuals with disabilities during evacuations.

Submitter Information Verification

Submitter Full Name: GLENN HEDMAN
Organization: UNIV OF ILLINOIS AT CHICAGO
Street Address:
Committee Statement

Resolution: The input doesn't address places of employment which might not be accessible to the public for goods and services; emergency evacuation planning is outside the scope of Ch. 7; minimum 48 in. stair width would still be required even if these devices are provided; the committee recognizes this needs additional work but is not opposed to provisions for stair travel devices.
Evaluating the physical demands on firefighters using hand-carried stair descent devices to evacuate mobility-limited occupants from high-rise buildings

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\textsuperscript{d}Division of Health Policy and Administration, School of Public Health, The University of Illinois at Chicago, Chicago, IL, USA

A R T I C L E   I N F O

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EMS
Firefighter
Emergency evacuation
Stair descent devices
Evacuation of individuals with disabilities

A B S T R A C T

The physical demands on firefighting personnel were investigated when using different types of hand-carried stair descent devices designed for the emergency evacuation of high rise buildings as a function of staircase width and evacuation urgency. Twelve firefighters used three hand-carried stair descent devices during simulated urgent and non-urgent evacuations. The devices were evaluated under three staircase width conditions (0.91, 1.12, and 1.32 m). For comparison, an urgent manual carry was also performed on the 1.12 m wide stairs. Dependent measures included electromyographic (EMG) data, heart rates, Borg Scale ratings, task durations and descent velocities. Results indicated that the stair chair with extended front handles, which allows the front person to descend the stairs facing forward, reduced the time integrated back muscle EMG by half and showed a descent velocity that was 1.8 times faster than the other stair descent devices in the study. There were no differences across staircase widths.

1. Introduction

Fire service personnel are often the first people called upon when evacuating large multi-story buildings during both emergency and non-emergency conditions, for example, extended power outages. During such evacuations, firefighters (FF) may need to transport building occupants with motor disabilities down several flights of stairs. Epidemiologic data from Emergency Medical Service (EMS) workers suggest that such tasks are often associated with injury development (Gershon et al., 1995; Hogya and Ellis, 1990; Karter and Molis, 2011; Maguire et al., 2005). Furber et al. (1997), in their study of 477 workers' compensation claims made by Australian ambulance workers, found that within private residences stairs were a strong factor contributing to injuries reported by ambulance officers. Our prior work, comparing simulated stair descents with a hand-carried stair chair, a backboard, and a stretcher, found that even with a lightweight mannequin (48 kg), a significant percentage of population would not have adequate back strength and would likely experience compression forces in excess of 3000 N (Lavender et al., 2000) when performing these evacuation tasks.

Stair transport tasks can be done by using one- or two-person manual carry techniques or, if available, by using one of several different types of stair descent devices. Hand-carried evacuation chairs are commonly used by fire department personnel and often found on emergency response vehicles. Alternatively, emergency stair descent devices may be owned by building occupants or building owners and used by fire service personnel during evacuations. While several stair descent devices or “evacuation chairs” are currently on the market for emergency evacuation of individuals with motor disabilities from high rise buildings, there is little empirical data indicating their impact on the physical demands placed on the firefighter who may be called upon to use these hand-carried chairs. The National Fire Protection Association (NFPA) Life Safety Code indicates that when descending stairs, an evacuation device should be easily operable by one person who is trained on its use, and that above average weight or strength should not be required for proper

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operation (NFPA 101-2009 Annex, A.7.2.12.2.3(2) 8][a]). Moreover, subtle changes in equipment design can have substantial effects on the physical demands, especially when stair descent tasks include turns on landings (Lavender et al., 2007a,b; Fredericks et al., 2002). For example, Lavender et al. (2007a,b), found that changing handle locations on stair chairs significantly affected 90th percentile muscle recruitment levels as different chair handle configurations were carried through a landing. Fredericks et al. (2002) reported differences in spine compression estimated using the static strength prediction program across four types of hand-carried stair chairs. They found that designs that supported the lead person facing forwards when descending the stairs resulted in lower spine compression values for this lead individual.

Evacuation conditions including the staircase width and the urgency of the evacuation may also impact the physical demands on the firefighters, particularly if the stair descent involves landings where the direction of travel changes. Drury (1985) provided evidence that task performance measures, for example task duration or movement speed, are dependent upon the available space, at least up to the point where space no longer potentially restricts movement. Likewise, Karwowski and Alsabi (1991) reported a trend toward a lower acceptable weight of lift with more restricted lifting spaces. This implies that staircase dimensions could impact muscle recruitment levels as smaller versus larger landings are negotiated by evacuators. As for urgency, several studies have shown increases in biomechanical loading as movement speed increases (Marras, 2008). Under urgent evacuation conditions, one could expect more rapid motions, and perhaps more co-contraction of antagonistic muscles as the body is stabilized under the increased dynamic external loads.

The objective of this study was to compare biomechanical and physiological demands on firefighters as they used three existing hand-carried stair descent devices and a two-person manual carry without a chair. Specifically, the following hypotheses were tested:

1. There are significant differences among existing hand-carried stair descent devices with regards to task performance measures and the physical demands placed on evacuators as measured via heart rate, electromyography, and subjective measures of perceived exertion.
2. The physical demands on the evacuator increase with narrower staircases.
3. The physical demands on the evacuator increase during urgent conditions.
4. The physical demands placed on the firefighters are dependent upon the combined effects of chair design, staircase width, and the level of evacuation urgency.

Additionally, the study assessed usability issues with each of the evaluated devices through video analysis and a structured interview process.

2. Methods

2.1. Participants

Twelve male professional firefighters between the ages of 20 and 46 (mean = 32 years) were recruited to serve as the evacuators for this study. Mean height and weight were 1.83 m (1.76–1.96 m) and 88 kg (71–118 Kg). Their fire service experience ranged from 1.5 to 17 years (mean = 6.6 years). All participants signed institutional review board approved consent documents.

2.2. Experimental design

A repeated measures randomized block experimental design was used in which participants experienced all combinations of the three tested hand-carried stair descent devices, three staircase widths, and two urgency conditions (urgent and non-urgent). The experiment was blocked on the three staircase widths which were selected based upon NFPA 101-2009 code describing staircase widths based on occupant load. Specifically, this study evaluated stair descent tasks performed under the following stair case widths: 0.91 m (building occupancy < 50), 1.12 m (building occupancy < 2000), and 1.32 m (approximates the 1.42 m required for >=2000 occupants). Within each staircase width, the sequence of stair descent devices was randomized. The sequence of “urgent” versus “non-urgent” conditions with the stair descent devices was counter-balanced across participants. For comparison purposes, an extra condition was included in which a manual underarm carry was performed on the 1.12 m wide staircase under an urgent condition. Pilot testing suggested that this carry was most physically demanding. Therefore, to minimize participant fatigue, the manual carry was only performed on the medium width stairs and as an urgent condition.

In each experimental condition, participants descended two flights of stairs and proceeded through two landings. As they performed this task, dependent measures were obtained that included task performance measures, muscle recruitment, spine kinematics, and physiologic demands. Task performance measures were comprised of overall task duration and stair descent velocity. Muscle recruitment was assessed using surface electromyographic (EMG) signals sampled bilaterally from the Erector Spinae, Latissimus Dorsi, Deltoid, and Biceps muscles. Spine kinematics were assessed using a Lumbar Motion Monitor (LMM) (Chattanooga Group, Chattanooga, TN, USA). Physiological demands were obtained by sampling the heart rate and ratings of perceived exertion (Borg Scale) at the completion of each condition. Usability assessments data were obtained from post-study interviews.

2.3. Apparatus

The three selected hand-carried devices (Fig. 1) represent different design approaches that have been developed to transport individuals who are injured or who have ambulatory disabilities down multiple flights of stairs. The "extended handle" stair chair (Stair Pro 6250, Stryker, Kalamazoo, MI) was selected to represent a common stair chair design found on FF/EMS vehicles. This chair allowed the lead person to walk down the stairs facing forwards. The "basic" stair chair (Junkin, JSA-800-CS, Louisville, KY) was selected because this chair was narrower than the extended handle stair chair which would potentially be advantageous for use on narrow staircases. The third device was a fabric seat with sewn in handles (Comfort Carrier, Broadened Horizons-GimpGear, Maple Grove, MN). The relevant dimensions that affect how these three devices are used are provided in Fig. 2.

The staircase was 1.32 m wide and the corresponding landings were 1.32 m deep. The width of the staircase and the depth of the landing were narrowed using tape lines and partitions placed on the landings to simulate the 0.91 and 1.12 staircase widths. The rise and run of each step was 17 cm and 28 cm, respectively.

EMG data were obtained using a Delsys (Boston, MA) wireless EMG system sampled at 1000 Hz. Heart rate data were sampled using a chest-band transmitter unit that displayed data on a wristwatch (Polar Electro, Inc., Lake Success, NY). The participants were polled as to their perceived level of effort at the completion of each stair descent using a 10-point Borg-type rating system (Borg,
Fig. 1. The three hand-carried stair descent devices evaluated in the study along with the manual carry technique. The participant always assumed the follower roll behind the mannequin.

Fig. 2. The relevant dimensions on the three hand-carried stair descent devices. Some of dimensions for the fabric seat are variable and depend on the size of the occupant.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Basic Stair Chair (cm)</th>
<th>Extended Handle Stair Chair (cm)</th>
<th>Fabric Seat (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Height of front handle above the floor when device is on the floor</td>
<td>30</td>
<td>15</td>
<td>Variable</td>
</tr>
<tr>
<td>(b) Height of rear handle above the floor when device is on the floor</td>
<td>74</td>
<td>76</td>
<td>38</td>
</tr>
<tr>
<td>(c) Length of the front handle</td>
<td>20</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>(d) Length of rear handle from seat back</td>
<td>25</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>(e) Distance from seat reference point to distal end of front handle</td>
<td>66</td>
<td>74</td>
<td>53</td>
</tr>
<tr>
<td>(f) Distance from distal end of rear handle to distal end of front handle</td>
<td>102</td>
<td>109</td>
<td>53</td>
</tr>
<tr>
<td>(g) Seat length</td>
<td>45</td>
<td>40</td>
<td>Variable</td>
</tr>
<tr>
<td>(h) Seat width</td>
<td>33</td>
<td>38</td>
<td>Variable</td>
</tr>
</tbody>
</table>
quires you leave the building as quickly as possible.

The participant was prepared for the study by placing surface EMG electrodes bilaterally over the: (1) Erector Spinae muscles at the L3 level approximately 5 cm from the midline; (2) the Latissimus Dorsi muscles at the T7 level approximately 13–15 cm from the midline; (3) the belly of the Anterior Deltoid muscles; and (4) the belly of the Bicep muscles. A baseline sample of the EMG activity during quiet standing (resting EMG) was obtained. The heart rate monitor was strapped on the chest and a resting heart rate value was obtained.

A series of maximal voluntary isometric exertions were performed to elicit maximal EMG signal amplitudes for each muscle that could be used for normalizing the data obtained during the stair descent tasks. These tasks were performed in postures that approximated the postures observed during pilot testing that occurred during the more physically demanding portions of the stair descent tasks. The maximal exertion task for the Erector Spinae muscles required participants perform a back-style lift from a position in which their torsos were flexed approximately 30 degrees. The maximal exertions for each Latissimus Dorsi muscle were performed by having the participant pull backward and upward on a handle located at mid thigh level. Bicep maximal exertions were performed with the participant standing upright and the elbow flexed approximately 70 degrees. Anterior Deltoid maximal exertions were performed by having the standing participant pull upward on the dynamometers with the shoulder flexed approximately 30 degrees and the elbow fully extended.

Following the maximal exertions, the Lumbar Motion Monitor was placed on the participant and baseline data were obtained as the participant stood in an upright neutral posture. The participant, with the help of a member of the research team, carried the extended handle stair chair down the stairs with a nominal load (20.4 Kg) to become familiar with the simulated evacuation task extended handle stair chair down the stairs with a nominal load (20.4 Kg) to become familiar with the simulated evacuation task. During each trial the participant carried the mannequin from the “follower” position (head end) as this has previously been reported to be the more physically demanding position across a variety of stair chair devices (Fredericks et al., 2002). The participant was assisted by a consistent member of the investigative team who assumed the leader position (foot end). This team descended two flights of stairs and moved through two landings. After the second landing the team started down a third flight of stairs but were stopped after the participant stepped on the second step at which point the data collection was completed and the team returned to the landing they had just passed where they set down the mannequin. A time marker was used to differentiate in the data stream when the participant was on the stairs and on the landings. This same time marker was used to obtain the descent duration data. At the completion of each descent the participant’s heart rate was obtained and the participant was asked to provide a rating of perceived exertion. A nearby elevator brought the participant and the chair (with occupant) back to the initial starting level. Descent tasks were separated by at least five minutes to minimize fatigue development.

Following the stair descent tasks, each participant participated in a structured interview where open-ended questions were asked that aimed at identifying usability issues with devices as well as identifying features of each device that facilitated or hindered completion of the task. These interviews typically lasted 10–15 min during which the participants were shown photographs of the devices to facilitate comments specific to each device.

2.5. Data analysis

For each participant, raw EMG signals were processed using a MATLAB program that employed high and low pass filters of 25 and 450 Hz, respectively. Data were rectified and smoothed with a moving average window of 150ms (Hanning filter). The processed EMG data from each muscle were normalized to their maximum values obtained during maximum isometric contractions. Timing marker data were used to extract data during flight and landing. Given that the carrying task on the stairs is largely a static exertion by the back and the arm muscles, the normalized EMG data were averaged over the sample obtained from each flight of stairs. These averaged data from the two flights were then averaged to obtain the mean activation level while descending the stairs. These mean values were expected to give more robust estimates of the muscle recruitment levels and the resulting potential for localized muscle fatigue over the course of this part of the stair descent task than an estimate of the peak value. In addition, this mean value was multiplied by the average stair flight duration across the two flights to yield an integrated EMG value (mean activity* stair flight duration). This was done for the data from both the urgent and non-urgent conditions. During the non-urgent conditions the task was performed in a continuous manner but at a slower pace than that observed during the urgent conditions. Due to task symmetry during the flight phase, values obtained for each of these quantities were averaged across the muscle pairs for each subject. For the landing data, the 90th percentile EMG values calculated for each of the two landings were averaged. The largest averaged 90th percentile landing response for each bilateral muscle pair was analyzed. The rationale for using the 90th percentile on the landing was that we anticipated there would be short peaks in the EMG activity as the evacuation team transitions on to or off of the landing, or as they as they make the 180 degree turn that would be washed out if the mean value was used. Heart rate data were scaled relative to anticipated maximal heart rate (220 – age) and converted to a percentage.

3. Results

3.1. Task performance

The total duration of the flight-landing-flight-landing evacuation task was not affected by staircase width. Across all stair width conditions the extended handle stair descent device led to the shortest evacuation durations, although the difference was reduced under the narrowest stair width condition (p = 0.028). Fig. 3a shows the descent duration data for the 1.12 m staircase width during the urgent condition as this included the manual carry
condition which resulted in descent durations in between those observed for the basic stair chair and those observed for the fabric seat. Another way of viewing these data is through the calculated descent speed (Fig. 3b), which is based on the distance traveled along the stairs and the distance traveled on the landings (Peacock et al., 2012), during the urgent conditions for the same stair width. Consistent with the duration data, the egress velocity with the extended handle stair chair was significantly faster. Post-hoc testing identified the fabric seat as being slightly, but significantly, faster than the basic stair chair.

3.2. Physiologic demands

The overall physiologic demands, as assessed by the heart rate measure at the completion of the stair descent task, were not affected by staircase width but were affected by the evacuation device. Task completion heart rates were significantly less with the extended handle stair chair. When compared with the manual carry, all of the stair descent devices reduced the physiologic demands during the urgent descents on the 1.12 m staircase (Fig. 4). Ratings of perceived exertion followed a similar trend in which the extended handle stair chair had a significantly lower rating than the fabric seat or basic stair chair which were equivalent (Fig. 5). All had significantly lower ratings than the manual carry condition.

3.3. Analysis of EMG data from the stairs

Analysis of the mean activation levels while on the stairs showed that the evacuation devices significantly affected the Erector Spinae and Bicep activations (Table 1). These same muscles also showed significant interactions between the evacuation device and the urgency condition as did the Deltoid muscles. Under non-urgent conditions the mean Erector Spinae activations were lowest when the extended handle and the basic stair chairs were used (Fig. 6a). However, under urgent conditions only the basic stair chair showed lower Erector Spinae activation levels. The fabric seat and the extended handle stair chair were not statistically different from each other or from the Erector Spinae response during the manual carry on the 1.12 m wide stairs. When the Erector Spinae response was multiplied by the stair task durations (integrated activation levels), a different picture emerged (Fig. 6b). Here the extended handle stair chair resulted in significantly lower integrated activation levels of the Erector Spinae when compared with the other evacuation devices used in both the non-urgent and the urgent conditions. Under the urgent conditions, integrated activation levels also show that the basic stair chair is significantly better than the fabric seat, and all devices were better than the manual carry.

3.4. Analysis of EMG data from the landings

For the landings, the analysis focused on the muscle within each bilateral pair that had the higher 90th percentile activation level. Overall, the devices affected the recruitment of the Erector Spinae and the Bicep muscles (Table 1). These same muscles showed significant device by urgency interactions. As shown in Fig. 7a, the Erector Spinae activations in the landing were lowest for the extended handle stair chair under the non-urgent conditions and for the extended handle and basic stair chairs under the urgent conditions. Relative to the fabric seat and the manual carry during the urgent decent on 1.12 m wide staircase, Bicep activations were comparatively higher for these same chairs (Fig. 7b), in part due to the need to lift the chairs higher on the landing. Landing width,
while having an effect on the Deltoid muscles, did not show any differential across the evacuation devices as evidenced by the non-significant device by width and device by urgency by width interactions.

### 3.5. Trunk motion analysis

Trunk motions were primarily in the sagittal plane during these hand-carried stair descent tasks. Peak forward flexion was greater on the stairs than on the landings and showed the same trend across devices. Fig. 8 shows that the peak trunk flexion on the stairs when using the extended handle stair chair was approximately 7 degrees less than when using the basic stair chair and 11 degrees less than when using fabric seat. All devices resulted in significantly less forward trunk flexion than that observed during the manual carries (43 degrees).

### 3.6. Usability analysis

Following the stair descent tasks the participants were interviewed and asked to identify features or characteristics of each device that they liked and disliked. The results of these interviews are summarized in Table 2. For the basic stair chair, the narrowness was viewed by some as positive in that it would work well in tighter spaces, while others suggested there was less side-to-side stability. For the extended handled stair chair, the width was noted as being a positive factor in that the handles were approximately shoulder width apart which allowed a more natural stance. Moreover, it was recognized that the evacuation was quicker with this device, largely because it afford a forward facing posture by the lead evacuator. It should be recognized that the width of this device was potentially perceived as a problem in tight spaces. The handiness of the fabric seat was recognized along with the feature that the handle locations allowed the follower to keep their arms straight on the stairs. On the negative side, the handles were uncomfortable and there was the recognition that it would be difficult to put this under a person prior to the egress and that once the egress was initiated it would be very difficult to stop and rest as this would require setting the occupant on the floor. Also included in this usability analysis was the manual carry.

#### Table 1

$P$-values from the three analyses conducted on the EMG data. Values in bold font are less than 0.05.

<table>
<thead>
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<th>Muscle group</th>
<th>Analysis</th>
<th>Independent variable</th>
<th>Erector spinae</th>
<th>Latissimus dorsi</th>
<th>Deltoid</th>
<th>Bicep</th>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Landing: Device (D)</td>
<td>&lt;0.001</td>
<td>0.408</td>
<td>0.689</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90th percentile Width (W)</td>
<td>0.697</td>
<td>0.052</td>
<td>0.032</td>
<td>0.303</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urgency (U)</td>
<td>0.002</td>
<td>0.024</td>
<td>0.001</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D*W</td>
<td>0.666</td>
<td>0.539</td>
<td>0.421</td>
<td>0.571</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D*U</td>
<td>0.001</td>
<td>0.323</td>
<td>0.002</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D<em>W</em>U</td>
<td>0.287</td>
<td>0.844</td>
<td>0.685</td>
<td>0.914</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 6. The mean normalized EMG data and the mean normalized EMG multiplied by the stair duration for the Erector Spinae muscles (a and b) and for the Bicep muscles (c and d).
was necessary to perform the evacuation. However, they believed it was hard to hold the individual and this would be even more of a problem for heavier evacuees. In addition, they reported it was difficult to see the stairs and, like the fabric seat, it would be difficult to stop and rest during a long descent.

4. Discussion

The devices selected for this study were based on specific design features, for example width, construction style, storage space requirements, and handle configuration, that could potentially affect the handling, speed of egress, and physical demands on the evacuators. The integrated EMG data from the stairs, the heart rate, the perceived effort, the trunk posture and the evacuation performance data all support the use of an extended handle stair where the lead evacuator faces forwards while descending the stairs. These differential findings between the extended handle stair chair and the basic stair chair are consistent with Fredericks et al. (2002), who compared spine compression values obtained with the University of Michigan’s Three Dimensional Static Strength Prediction Program (3DSSPP®). The extended handle stair chairs tested in the Fredericks et al. (2002) study, while not significantly different from each other, resulted in lower spine compression values from the 3DSSPP for the follower position than those modeled for their version of the basic stair chair. The extended handle stair chair with the lower compression force in the Fredericks study also had longer duration is also related to the development of fatigue in the evacuators. Slower descents require longer exertions on the part of the evacuators, and as noted in the usability analysis, slower descents with devices like the fabric seat where it would be difficult to stop and rest, represent a significant fatigue concern for the evacuators.

<table>
<thead>
<tr>
<th>Device Positive comments</th>
<th>Negative comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic stair chair</td>
<td>• Lighter</td>
</tr>
<tr>
<td></td>
<td>• Smaller</td>
</tr>
<tr>
<td></td>
<td>• Easy operation</td>
</tr>
<tr>
<td></td>
<td>• More Portable</td>
</tr>
<tr>
<td></td>
<td>• Works in narrow spaces</td>
</tr>
<tr>
<td></td>
<td>• Can keep arms straight</td>
</tr>
<tr>
<td>Extended handle</td>
<td>• Easier to set up</td>
</tr>
<tr>
<td>stool chair</td>
<td>• All components lock</td>
</tr>
<tr>
<td></td>
<td>• Wider</td>
</tr>
<tr>
<td>Fabric seat</td>
<td>• Handy</td>
</tr>
<tr>
<td></td>
<td>• Easy to have in small bag</td>
</tr>
<tr>
<td></td>
<td>• Easy operation</td>
</tr>
<tr>
<td></td>
<td>• Occupant torso up, away from body</td>
</tr>
<tr>
<td></td>
<td>• Can keep arms straight</td>
</tr>
<tr>
<td></td>
<td>• Less room required to turn</td>
</tr>
<tr>
<td>Manual carry</td>
<td>• Easy, quick, gets job done</td>
</tr>
<tr>
<td></td>
<td>• Can hold weight against chest</td>
</tr>
<tr>
<td></td>
<td>• No rocking</td>
</tr>
<tr>
<td></td>
<td>• Arms around occupant</td>
</tr>
<tr>
<td></td>
<td>• Less anxiety</td>
</tr>
<tr>
<td></td>
<td>• More secure</td>
</tr>
<tr>
<td></td>
<td>• Requires less room to make turn</td>
</tr>
<tr>
<td></td>
<td>• OK for 1–2 floors</td>
</tr>
</tbody>
</table>

Fig. 7. The averaged 90th percentile EMG responses from the Erector Spinae (a) and Bicep (b) muscles as the hand-carried devices were moved through the two landings.

Fig. 8. The peak forward torso flexion on the stairs by the evacuator in the follower role.
The hand-device interface is another important aspect of these hand-carried devices. The fabric strap handles with the fabric seat were reported to be uncomfortable (Table 2). The localized contact stress was noted in our pilot testing and as a result we strongly encouraged the evacuators to select appropriately sized gloves from three types of rescue gloves we made available to them. Even with the gloves the participants reported discomfort. So in addition to the potential fatigue limiting the descent, the hand discomfort could be an additional limiting factor. Pheasant (1996) describes more comfortable handle designs as having a circular cross section so as to eliminate the “hot spots” where there would be added tissue compression on the edges. Moreover, the fabric handle, because it is not rigid laterally compresses the fingers that are used in a hook grip with a force proportional to the weight of the evacuee, therein suggesting the discomfort would be more severe with heavier evacuees.

Other handle issues emerged for the basic stair chair in that the rear handles were considered too short and lacked a locked position when in use. On the extended handle stair chair, the handles did lock, but were reportedly too high on the chair and therefore required elbow flexion on the landings. Interestingly, the handle heights on the back of the basic and extended handle stair chairs were the same, both 0.76 m, but the way the leader held the two chairs was different (elbows flexed with the basic chair and elbows extended with the extended handle stair chair) due to body leg interference with the basic chair or lack of it with the extended handle chair. This difference in the arm posture of the leader led to the rear wheels contacting the landing with the extended handle chair but not with the basic stair chair. While noted as a negative comment in the post session interview, perhaps this rear wheel contact could be used to reduce the biomechanical loads on the evacuator in the follower position while on the landing.

All of the hand carried devices tested in this study were considered by the participants to be superior to the manual carry. The greater spine flexion on the stairs, the highest levels of Erector Spinae recruitment, the challenges of holding the evacuee, and the poor stair visibility support the belief that this carry should only be used in extreme cases where no assistive equipment is available and the conditions require urgent action on the part of the rescue personnel. It should be recognized that there are a variety of manual carry techniques that are possible. Some training materials demonstrate a manual carry with a participant on each side of the evacuee (FEMA, 2002), however, this technique could only be used in the widest staircase condition as it essentially requires stairs that can accommodate approximately three body widths. Moreover, during an emergency evacuation it would interfere with any upward traffic flow, for example, additional fire service personnel on their way to upper floors. Single-person manual carries in which the evacuee is on the back of the evacuator or over the shoulder (what used to be termed the “fireman’s carry”) were not considered here given the potential inability for some evacuees to assist with the on the back method or the potential for excessive load on internal structures with the fireman’s carry (FEMA, 2002), and the probability that an evacuee would be overweight or obese (CDC, 2012), therein representing a considerable biomechanical load for a single evacuator.

There are several limitations of this study that should be noted. First, we used a rescue mannequin rather than a live participant. From the evacuator’s perspective, this may have made the tasks easier in that there was no physical or emotional occupant response that could change the dynamics of the evacuation. More importantly however, we cannot provide any information as to occupant preferences and concerns with the tested devices. We did not evaluate the device ingress given the flexibility of the rescue mannequin is not the same as that of a live person and would result in data that was not representative of the real situation. Future work needs to address these components as clearly these devices are designed for people as opposed to rescue mannequins.

A second limitation is that the descent only included two flights of stairs and two landings. Had there been a longer descent it is possible there would have been notable differences in the ratings of perceived exertion and the heart rate measures between the fabric seat and the basic stair chair. But given the number of observations obtained from each individual we were concerned about cumulative participant fatigue and did not want to cause localized fatigue in the muscles sampled as this alters the EMG signal (Basmajian and Luca, 1985). Rest breaks and sequence randomization across participants was used to control the effects of fatigue across the session. Likewise, the use of a heavier occupant was not considered for the same reasons. All participants, who were professional firefighters, indicated that our 73 kg occupant was light by today’s standards. Pilot testing with occupant weights up to 136 kg suggested we would obtain similar results across the evaluated devices, however this pilot also indicated that participant fatigue would be a significant issue given the number of stair descents performed.

An additional limitation is that we had no other pedestrian traffic on the stairs as done by Adams and Galea (2010) that would restrict movement while on the stairs or the landing as described by Sheilds et al. (2009) during the World Trade Center evacuation. We considered using a mannequin on the stairs for this purpose during pilot testing and found that this obstacle, had little impact on the actual descent process, once the line of descent was selected, given the one person width of the evacuation team. Had there been slower moving pedestrians also descending the stairs, this would have increased the durations and not provided good indicators of potential egress velocities with the tested devices.

5. Conclusions

We found there are significant differences among existing types of hand-carried stair descent devices with regards to evacuation times and the physical demands placed on evacuators during evacuations involving stair descents. Based on these findings we would strongly recommend the use of hand-carried stair descent devices that enable the lead evacuator to face forward when descending the stairs and can be set down without setting the occupant directly on the floor should the evacuators need to rest during long descents. Staircase width did not affect the physical demand or performance measures sampled in this study. However, if total building occupant egress was considered, all of these hand-carried devices would significantly limit evacuation rates given the relatively slow stair descents with these devices relative to ambulatory building occupants and the limited ability for passing on narrower stairs.

Acknowledgment

Federal Emergency Management Agency — Assistance to Firefighters Grant Program Grant # EMW-2009-FP-01944.

References

AN ERGONOMIC EVALUATION OF HAND-CARRIED, TRACK-TYPE, AND SLED-TYPE STAIR DESCENT DEVICES USED FOR HIGH RISE BUILDING EVACUATION

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Professional firefighters participated in a study that compared physical demands and task performance measures as three hand-carried devices, three track-type evacuation chairs, and three evacuation sleds were used to transport an occupant down flights of stairs that included two landings. Two staircase widths, 1.1 and 1.3 m, were evaluated as the width of the stairs was hypothesized to affect the dependent measures which included heart rate, electromyographic response, and decent velocity. The data indicate there were trade-offs between the types of evacuation devices with some showing high physical demands on the stairs while others showed high demands on the landings. Overall, track-type devices and sled-type devices resulted in reduced physical demands relative to the hand-carried devices.

INTRODUCTION

Fire service personnel are often the first people called upon when evacuating large multi-story buildings during emergency and non-emergency conditions. During such evacuations, firefighters (FFs) may need to transport building occupants who are ill or have physical disabilities down several flights of stairs.

While several stair descent devices are currently on the market for emergency evacuation of individuals with motor disabilities from high rise buildings, there is little empirical data indicating the physical demands placed on the evacuator. Prior research has shown considerable variation in musculoskeletal loads across different types of equipment, method of use, and relative position assumed by the emergency responder (Lavender et al., 2000). Moreover, subtle changes in equipment design can have substantial effects on the physical demands, especially when stair descent tasks include turns on landings (Lavender et al., 2007, 2012, 2013), when working on narrower versus wider staircases, and when evacuation tasks must be performed quickly versus under non-emergency conditions. The objective of this study was to compare the physical demands on FFs operating nine existing evacuation devices (Table 1) that represented three categories of stair descent devices: hand-carried devices, track-type devices, and sled-type devices. All have been developed to transport individuals who are ill or who have ambulatory disabilities down multiple flights of stairs. Specifically, the following hypotheses were tested:

1. There are significant differences among existing evacuation devices with regards to the physical demands placed on firefighters as measured with objective heart rate and electromyographic measures.
2. There are differences in occupant evacuation velocities across the nine evaluated evacuation devices.
3. The physical demands on the evacuator are reduced with wider staircases.

METHODS

Experimental Design. The analysis presented in this paper compares data obtained across three studies, one with each category of device. Within each study, data were collected using a repeated measures design in which the participants used each of the three devices within the category being evaluated on two staircase widths. Within each staircase width, the sequence of descent devices was randomized.

Participants descended two and a half flights of stairs with the hand-carried devices and three flights of stairs with the track-type and sled-type devices. With all devices the descent task included two landings. The experiments were blocked on the staircase width. These widths were selected based upon NFPA 101-2009 code describing staircase widths based on occupant load and included a 1.12m width (building occupancy < 2000) and a 1.32 m width (approximates the 1.42 m required for >=2000 occupants). Within chairs, the sequence of urgent versus non-urgent conditions was counter-balanced across participants.
The dependent measures used in this analysis focused on the surface electromyographic (EMG) signals from the Erector Spinae, Latissimus Dorsi, Deltoid, and Biceps muscles and the heart rate as an overall measure of physiologic demands. Task performance measures included the descent velocity with each of the stair descent devices.

Participants. Twelve FFs took part in each of the studies. Some participated in more than one study. In all, twenty male professional firefighters between the ages of 20 and 61 (mean = 36.3 years) were recruited for this series of studies. Mean height and weight were 1.82 m (1.76-1.96 m) and 86.5 kg (70.7 kg - 117.5 kg). The fire service experience ranged from 1.5 to 23 years (mean = 9.25 years). All participants signed IRB approved consent documents. The hand-carried and sled-type devices required two evacuators. One of the investigator (GH) served as the secondary evacuator for each of these data collection sessions.

Table 1. Evacuation devices evaluated in the study. The bold text in the device type column indicates how the device is referred to in the text.

<table>
<thead>
<tr>
<th>Study Name, Device Type, Model, Manufacturer</th>
<th>Rationale for Inclusion</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Basic” Stair Chair, Confined Space Evacuation Chair, Model: JSA-800-CS, Junkin Safety Appliance Company</td>
<td>This is a basic evacuation chair has basic features including flip up handles for the leading and following evacuators and two wheels for rolling the occupant on flat surfaces. This chair requires two evacuators to manually carry an occupant. On account of the chair width and the handle length, the lead person descends the stairs facing backwards.</td>
<td><img src="basic.jpg" alt="Picture" /></td>
</tr>
<tr>
<td>“Extended Handle” Stair Chair: Stair-PRO, Model: 6250, Stryker EMS</td>
<td>This chair differs from the “Basic” SC in that it has handles that extended in front. The width of this design allows the lead person to stand in between the extended handles and face forwards going down the stairs.</td>
<td><img src="extended_handle.jpg" alt="Picture" /></td>
</tr>
<tr>
<td>“Fabric Seat”, Model: Comfort Carrier, Broadened Horizons</td>
<td>This fabric seat was included as it represents one of the lower cost options and could be easily stored in an office or apartment by the potential occupant. This device has handles sewn in that allow the lead operator to lift the occupants knees while the following evacuator holds handles positioned behind the occupant’s shoulders.</td>
<td><img src="fabric_seat.jpg" alt="Picture" /></td>
</tr>
<tr>
<td>“Standard” Track-Type Stair Chair, EZ glide Evacuation Chair, Model: 59-E, Ferno-Washington</td>
<td>This chair is similar to many of the track-style evacuation chairs currently used by fire departments. The four wheel configuration allows it to be rolled through stair landings. Designed to be operated by a single evacuator.</td>
<td><img src="standard.jpg" alt="Picture" /></td>
</tr>
<tr>
<td>“Narrow” Track-Type Stair Chair, Rescue Chair, Model: 1500, AOK Global Products LTD</td>
<td>This chair was only 15 inches wide and therefore presented a narrower option that would potentially work better on narrower staircases. The four wheel configuration allows it to be rolled through stair landings. Designed to be operated by a single evacuator.</td>
<td><img src="narrow.jpg" alt="Picture" /></td>
</tr>
<tr>
<td>“2-Wheel” Track-Type Stair Chair, Stairway Evac. Chair, Model: 300H (MK3), Evac+Chair, LLC</td>
<td>On the stairs this chair is very similar to the “Standard” and “Narrow” chairs. On the landings, this chair has two wheels in front which means that the evacuator supports part of the occupant’s weight as it is rolled through landings, although rear wheels can be deployed for longer horizontal travel distances. Designed to be operated by a single evacuator.</td>
<td><img src="2-wheel.jpg" alt="Picture" /></td>
</tr>
</tbody>
</table>
Table 1. (continued) Evacuation devices evaluated in the study. The bold text in the device type column indicates how the chair is referred to in the text.

<table>
<thead>
<tr>
<th>Study Name, Device Type, Model, Manufacturer</th>
<th>Rationale for Inclusion</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Roll-up” Sled Med Sled Evacuation, Model: MS36, ARC Products LLC</td>
<td>This sled is made of semi-rigid plastic material which has a lower coefficient of friction that could affect control on the stairs and slide more easily through landings. This sled is designed to be operated with a belay method. Our firefighter participants indicated they thought this would be too slow so the following person grasped the single strap.</td>
<td><img src="image" alt="Sled" /></td>
</tr>
<tr>
<td>“Corrugated” Sled Evacuation Slyde, Model: 6400, Stryker EMS</td>
<td>This is a cost-effective evacuation sled made of corrugated polypropylene. The sled is operated by two evacuators, each grasping the two web handles at each end.</td>
<td><img src="image" alt="Sled" /></td>
</tr>
<tr>
<td>“Fabric Mat” Sled Model: ResQmat, Evac+Chair, LLC</td>
<td>Operationally, this sled is similar to the “Corrugated”, however, it can be easily shortened when transporting shorter individuals which should make it easier to maneuver on landings. There is a single loop strap for the leading and following evacuators allowing one-handed operation. This sled would potentially be more comfortable for the occupant as the bottom of this sled is covered with a foam mat.</td>
<td><img src="image" alt="Sled" /></td>
</tr>
</tbody>
</table>

**Apparatus.** The staircase used was 1.32 m wide and narrowed with tape lines and partitions placed on the landings. EMG data were obtained using Delsys wireless EMG systems and the spine kinematic data were sampled using a Lumbar Motion Monitor. Heart rate data were sampled using a chest-band transmitter unit that displayed data on a wristwatch (Polar Electro, Inc., Lake Success, NY). The chair occupant was a training mannequin having a mass of 73 kg.

Two video cameras captured each stair descent task. One of the investigators followed the participant down the stairs and through each landing while holding a video camera. The second video camera was positioned above the first landing to obtain overhead views as the landing was negotiated to provide data for the usability analysis.

**Procedures:** After signing the informed consent document the FF participants were prepared for the study by (1) instrumenting them with surface EMG electrodes, (2) eliciting maximal exertions used in normalizing the EMG data obtained during the stair descent tasks, (3) instrumenting them with a lumbar motion monitor, and (4) training them on the use of the equipment during which the participants practiced using the device by transporting the test occupant.

For the conditions being compared in this analysis, the instructions to the firefighter participants indicated that “the situation requires you leave the building as quickly as possible.” During data collection a repeating recorded message stating “this is an urgent condition” was played for possible. During data collection a repeating recorded message stating “this is an urgent condition” was played for possible.

As the participant descended flights of stairs and moved through two landings, a time marker switch was used to differentiate these different components of the task in the data stream. This same time marker was used to obtain the descent duration data. At the completion of each descent the participant’s heart rate was obtained. A nearby elevator brought the participant and the device (with occupant) back to the initial starting level. Descent tasks were separated by at least five minutes to avoid fatiguing the participants.

While the experimenters transferred the mannequin from one device to another as prescribed by the sequence of experimental conditions, the participants were required to secure the occupant using each device’s strapping system. This strapping was video-recorded at two different times to assess strapping durations.

**Data analysis.** The RMS EMG data from each muscle were normalized for each participant relative to maximum values observed during the maximal exertions. These data were averaged across the samples obtained from each flight of stairs and multiplied by the flight duration to yield an integrated EMG level (mean activity*stair descent duration). The values obtained from the multiple flights were averaged across the muscle pairs for each subject. The 90th percentile EMG values occurring during each of the two landings were extracted from each muscle’s RMS data stream and averaged. The greatest landing response for each bilateral muscle pair was analyzed. On the stairs, the data used in the analysis were always from the following evacuator. On the landings, the data are from the following evacuator for the hand-carried and track-type devices and from the leading evacuator for the sled-type devices as the leader with the sleds did most of the physical work to maneuver the sleds through the landings.
RESULTS

When working on the 1.12 and 1.32 m width stairs, the descent velocity, which includes the landings, was highest for the three track-type stair chairs and the hand-carried extended handle chair. The remaining two hand-carried devices were significantly slower. The sled-type devices were slowest overall. This was largely due to the time required to maneuver the sleds through the landing as opposed to the stair descent pace.

The overall physiologic demands, as assessed via heart rate, were highest when using the hand-carried fabric seat and the basic stair chair (47 to 48 percent of maximum age normalized heart rate). The seven other devices resulted in similar heart rates ranging from 33 to 40 percent of the participants maximum age normalized heart rate.

Analysis of EMG data from the stairs. All four muscle groups sampled showed significant differences across the 9 stair descent devices. There was no effect for staircase width, nor was the interaction between stair descent device and staircase width significant. Figure 1 a and b shows the averaged integrated EMG response from the Erector Spinae and Latissimus Dorsi muscles. The Erector Spinae response was lowest when using track-type stair chairs. These were followed by the three sled devices. The hand-carried extended handle stair chair showed integrated Erector Spinae responses that were very similar to the two of the three sleds. The remaining hand-carried devices, the basic stair chair and the fabric seat, resulted in significantly higher integrated EMG activity in the Erector Spinae muscles.

The Latissimus Dorsi muscle showed a different response (Figure 1b). For these muscles the sled devices along with the hand-carried extended handle stair chair had the lowest response. The track-type stair descent devices showed more Latissimus Dorsi activation, especially the Narrow track-type chair.

All of the track-type devices and sleds showed significantly lower Deltoid response as compared to the hand-carried devices. A similar trend was observed for the Bicep muscles, although the integrated activity for this muscle group with hand-carried fabric seat was approximately 6 times that observed for the track-type chairs and approximately twice that observed with the sleds. For the hand-carried basic stair chair, the integrated Bicep response was even larger than that observed with the fabric seat.

Analysis of EMG data from the landings. The 90th percentile Erector Spinae response on the landing significantly varied across devices and ranged from 35% for the sled-type devices to 52 % for the 2-wheel track-type device. In general, the sleds showed lower activation, although post-hoc analyses did not show these devices to be significantly lower than any of the other devices except for the 2-wheel track-type device. The Latissimus Dorsi responses (Figure 1c) for the hand-carried devices were significantly lower on the landing than the sleds which tended to be lower than the track-type devices. The 90th percentile deltoid response was generally low across all devices (< 20% MVC), with the exception of the 2-wheeled device which showed significantly greater Deltoid response (approximately 30% MVC). This was due to the evacuators having to support some of the occupant’s weight as the chair was rolled on two wheels through the landing. A similar effect was observed for the Bicep muscles. The hand-carried extended handle and basic stair chairs also had relatively high 90th percentile Bicep response values on the landing.

DISCUSSION

Devices were selected for this analysis based on their design features. Hand-carried devices are the most commonly found evacuation tools. The sleds represent a means to remove building occupants without lifting and carrying and perhaps are the most intuitive of the non-carried devices. These are marketed to high-rise healthcare and assisted living facilities. The track-type devices are becoming increasingly common in the fire service and have the distinct advantage of being operated by a single evacuator. Although with heavier occupants, for example more than 90 kg, some of the instruction manuals recommend using two evacuators.

These results indicate there are trade-offs between the different types of evacuation devices, however, the use of
track-type and sled-type devices rather than hand-carried devices is supported by the Erector Spinae and heart rate results. The generally higher Latissimus Dorsi activation on the stairs when using the track-type stair chairs, relative to that observed with the sled-type devices reflects the need to use this muscle group when controlling the rate of descent. The coefficient of friction on the bottom of the sleds was high enough that less activation of these muscles was required to keep these devices under control on the stairs. This muscle group was used on the landings with the sleds as the leader was providing the driving force to maneuver the sled on these horizontal surfaces. The following evacuator could not effectively assist with these exertions. The Latissimus Dorsi muscles were also activated with the track-type stair chairs on the landing. These peak activations occurred as the next flight of stairs was being initiated. Often this required the evacuator to tip the track-type stair chairs backwards (Standard, Narrow), but also there typically was an elevated activation of the Latissimus Dorsi as the chair was pushed over the first step which was considered part of the landing sub-task.

In addition to the physical demand data from the stairs and the landings, usability issues also need to be considered. The ease with which persons who can provide minimal assistance can be placed in or removed from these chairs is an issue that needs further attention. We did assess contact with the wall on one of the landings. As one might expect, the longer devices such as the sleds were more prone to wall contact when entering and leaving the landing.

CONCLUSIONS

We found there are significant differences among existing evacuation devices with regards to evacuation times and the physical demands placed on firefighters during stair descent. Interestingly, staircase width was not a factor for the 1.12 and 1.32 m wide stairs analyzed here.

ACKNOWLEDGEMENT

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REFERENCES


Evaluating the physical demands when using sled-type stair descent devices to evacuate mobility-limited occupants from high-rise buildings

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Abstract

The physical demands on evacuators were investigated when using different types of sled-type stair descent devices designed for the emergency evacuation of high rise buildings. Twelve firefighters used six sled-type stair descent devices during simulated evacuations. The devices were evaluated under two staircase width conditions (1.12, and 1.32 m). Dependent measures included electromyographic (EMG) data, heart rates, Borg Scale ratings, and descent velocities. All stair descent speeds were below those reported during pedestrian egress trials. With the exception of the inflatable device, the devices operated by two evacuators had higher descent speeds than those operated by a single evacuator. High friction materials under the sleds facilitated control and reduced the muscle demands on stairs but increased physical demands on the landings. Usability assessments found devices with shorter overall lengths had fewer wall contacts on the landing, and handles integrated in the straps were preferred by the evacuators.

1. Introduction

When high rise buildings need to be evacuated in emergencies or non-emergencies, for example during extended power outages, first responders (firefighter/paramedics and emergency medical service (EMS) providers) often need to transport individuals with mobility limitations down multiple flights of stairs. When these high-rise structures are hospitals or skilled nursing facilities, many of the facility staff will also be engaged in these evacuation activities given that many of the evacuees are immobile on their own (Manion and Golden, 2004). However, first responders, and even military personnel, may be called upon to serve as evacuators and assist in such evacuations.

In prior work, firefighter/paramedics indicated that stair transport was one of their most physically demanding and frequently performed work tasks (Conrad et al., 2000). Prior biomechanical studies have confirmed that the transporting of people can be very physically demanding (Fredericks et al., 2002; Lavender et al., 2000) and there is epidemiological evidence that such tasks performed by EMS workers are often associated with injury development (Gershon et al., 1995; Hogya and Ellis, 1990; Karter and Molis, 2011; Maguire et al., 2005). Furber et al. (1997) in their study of 477 worker compensations claims, specifically found that stair transport within private residences was a strong factor contributing to injuries reported by ambulance officers.

When disaster strikes, people use whatever is available in terms of equipment to conduct evacuations. A report of the 1994 evacuation of hospitals following the Northridge, California earthquake indicated that, for the six hospitals without electric power that were evacuated, no specialized devices were used (Schultz et al., 2003). Instead, evacuators used blankets or sheets, backboards, wheelchairs, and gurneys. However, different types of equipment are available to assist first responders and healthcare personnel in...
transporting individuals down flights of stairs. Most common are hand-carried stair chairs. These are minimally carried by two individuals, and depending on staircase width, patient weight, and evacuator availability, carried by as many as four individuals. Prior work by our research team and others has documented that stair descents with hand-carried chairs is a physically demanding task (Fredericks et al., 2002; Lavender et al., 2000, 2013). Track-type stair chairs, which eliminate the need for lifting/carrying and instead have evacuators gliding or rolling the chairs down the stairs on long tracks that bridge two or three stair nosings, reduce the load experienced by the evacuator (Fredericks et al., 2006; Mehta et al., 2015). Alternatively, sled-type devices are another option. As the name implies, patients in these devices are slid along corridors and slid down the stairs. These devices may be attractive to building owners and health organizations in that their cost is substantially lower than the track-type and some of the hand-carried devices and they are suitable for transporting patients that would be unable to maintain a sitting posture. Moreover, sliding should be easier than carrying and will therefore reduce the physical demands on the evacuators and possibly the number of evacuators required for each evacuate.

There are several variations of sled-type devices that are commercially available. Some require two evacuators for safe operation while some are designed to be used by a single evacuator. Some are made from hard plastic material, some are made from flexible plastic material that can be rolled up when not in use, some are made from fabric, and one product includes inflatable sections akin to an air mattress. Some of these devices have small rollers on the bottom which are designed to facilitate movement on horizontal surfaces. Some of the devices have two straps for the evacuators to hold on to while descending the stairs, while others have just one. In all cases, the sleds would be able to transport IV medications, however, they would not be in a position to drip during the transport period. Likewise, oxygen canisters could be transported along with the patient if necessary.

In addition to considering the physical demands on the evacuators, the evacuation performance also needs to be considered. For example, hand-carried evacuation devices, particularly those where the lead evacuator must descend the stairs walking backwards, have stair descent velocities that are slow relative to published pedestrian evacuation speeds (Peacock et al., 2012) and therefore may disrupt evacuation flow in emergency situations (Lavender et al., 2013). On the other hand, track-type devices have stair descent velocities that are well within the range of Peacock et al.’s (2012) evacuation speeds (Mehta et al., 2015). Adams and Galea (2010) reported vertical descent speeds on the stairs when using a drag mattress that were very similar to a hand-carried chair device yet significantly slower than that observed for a track-type stair chair.

Environmental features, such as the width of the staircase and landing are expected to impact both the physical demands on the evacuators and descent speed, particularly if the stair descent involves landings where there are changes in the direction of travel. Drury (1985) provided evidence that task performance measures, such as task duration or movement speed, are dependent upon the available space, at least up to the point where space no longer potentially restricts movement. Likewise, Karwowski and Hashim (1991) reported a trend towards a lower acceptable weight of lift with more restricted lifting spaces. This implies that staircase and landing dimensions could impact performance measures and muscle recruitment levels as sled-type devices are maneuvered through smaller versus larger landings.

The objectives of this study were to (1) compare the physical demands experienced by seasoned fire service personnel who served as evacuators as they used six sled-type devices, each representing a different design approach to transport individuals who are ill or who have ambulatory disabilities down multiple flights of stairs of varying widths; and (2) to assess usability issues with the tested devices through video analysis and a structured interview process. Specifically, the following hypotheses were tested:

1. There are differences among sled evacuation device designs with regards to the physical demands placed on evacuators as measured via heart rate, electromyographic measures, spine postures, and ratings of perceived exertion while descending the stairs and transporting evacuees through landings.
2. The physical demands on the evacuator increase with narrower staircases.
3. There are differences in occupant evacuation times across sled evacuation devices and as a function of staircase width.

2. Methods

2.1. Participants

Twelve male professional firefighters between the ages of 26 and 64 (mean = 41 years, sd = 12.4 years) were recruited to serve as evacuators for this study. Mean height and weight were 1.73 m (sd = 0.09 m) and 86 kg (sd = 20 kg). Their fire service experience ranged from 2 to 23 years (mean = 12.8 years, sd = 6.5 years), however, none were experienced with the sled-type devices used in this study. All participants signed IRB approved consent documents and were free from any musculoskeletal pain.

2.2. Experimental design

A repeated measures randomized block experimental design was used in which participants used the six evacuation devices on the two staircase widths. Four of the devices require two evacuators. For these devices, one of the investigators (GH) served as the second evacuator. The “leader” typically descends the stairs in front of the device and primarily provides the pull force to slide the sled through the landing. The “follower” descends behind the device and controls the descent while on the stairs and may be able to assist on the landing in a limited capacity as the devices generally cannot be pushed. Participants were asked to descend three flights of stairs, each with 10 steps, and proceed through two landings under each experimental condition. For the four devices that required two people, the participant repeated the descent so that data could be collected in both the leader and follower positions.

National Fire Protection Association (NFPA) Code 101-2009 specifies staircase widths based on building occupant load. Specifically, this study evaluated stair descent tasks performed with stair case widths of 1.12 m (building occupancy < 2000), and 1.32 m (approximates the 1.42 m required for ≥ 2000 occupants). Data collection in the experiment was blocked on the two staircase widths. The sequence of staircase widths was counterbalanced across participants, the sequence in which the six different devices was used for each staircase width was randomized, and the order in which the participant performed the task in the leader or follower positions was counterbalanced across the participants.

The dependent measures obtained as participants performed these tasks included task performance measures, levels of muscle recruitment, spine posture, and physiologic demands. Task performance measures were comprised of overall task duration, stair descent velocity, and time required for strapping the occupant into the sled. This latter measure was obtained with the occupant already in the sled, and in the case of the inflatable sled, did not
include inflation time. Muscle recruitment was assessed using surface electromyographic (EMG) signals sampled bilaterally from the Erector Spinae, Latissimus Dorsi, Tendoi, and Biceps muscles. These muscles were selected as they were expected to experience substantial loading during the evacuation tasks and to potentially vary across the different sled types used in the study. Three-dimensional spine postures were assessed using a Lumbar Motion Monitor (LMM). Physiological demands were obtained by sampling the heart rate and ratings of perceived exertion (Borg, 1982) at the completion of each condition. Maneuverability, one aspect of usability, was assessed using a camera mounted above one of the landings which required an 180° turn. Wall contact frequency and contact location were tallied for each device.

Other usability issues were assessed through structured post-study interviews which were conducted primarily by one of the investigators (P.R.). In the interview process the participant was asked to describe operability (from both the leader and follower positions), concerns about occupant safety and comfort, concerns about their safety and comfort, how well they felt they could complete the task and what features of the equipment made this easier or more difficult. At the end of the interview the participants were asked to rank the equipment in terms of ease of use and asked if they would recommend the equipment to the fire service, and to building owners. Pictures of the devices were shown to the participant as they talked about the different pieces of equipment so that there would not be any confusion regarding which device was being discussed.

2.3. Apparatus

The sled occupant was a training mannequin having a mass of 73 kg. The six sleds selected for this study are shown in Fig. 1. The staircase was 1.32 m wide and the corresponding landings were 1.32 m deep. The width of the staircase and the depth of the landing were narrowed using tape lines and partitions placed on the landings and the last step above the landing to simulate the 1.12 m staircase width. The rise and run of each step was 0.17 m and 0.28 m, respectively.

Trunk motion data were collected using the triaxial Lumbar Motion Monitor (LMM). (Chattanooga Group, Chattanooga, TN, USA). This device was attached to the body via a chest harness and waist harness and measures the relative motion between the top of the spine (LS/S1) and the lower part of the thorax. A telemetry system streamed the data at 60 Hz to a computer where one of the team members marked the stair and landing phases of each trial using key presses on the computer.

EMG data were obtained using a Delsys (Boston, MA) Trigno wireless EMG system. Data were sampled at 1000 Hz using the Motion Monitor Software™ (Chicago, IL). Heart rate data were sampled using a chest-band transmitter unit that displayed data on a wristwatch (Polar Electro, Inc., Lake Success, NY). The participants were polled as to their perceived level of effort at the completion of each stair descent using a 10-point Borg-type rating system (Borg, 1982).

Two video cameras (Kodak, Rochester, NY) captured each stair descent task. One of the investigators followed the participant down the stairs and through each landing while holding a video camera. The second video camera was positioned above the first landing to obtain overhead views as the sleds were maneuvered through the landing to provide data for the usability analysis. These images were used to quantify the number and type of contacts made by the device and/or evacuator with the walls while maneuvering through the landing. Wall contact could either be due to the evacuator touching the wall or due to the sled touching the wall. Therefore wall contact, depending upon the nature of the contact, could be an indicator of a space constraint imposed on the evacuator, or potentially a patient safety concern.

2.4. Procedures

After signing an IRB approved informed consent document, the volunteers were prepared for the study by placing surface EMG electrodes bilaterally over the: (1) Erector Spinae muscles at the L3 level approximately 5 cm from the midline; (2) the Latissimus Dorsi muscles at the T7 level approximately 13–15 cm from the midline; (3) the belly of the Anterior Deltoid muscles; and (4) the belly of the Biceps muscles. A baseline sample of the EMG activity during quiet standing (resting EMG) was obtained. The heart rate monitor was strapped on the chest and a resting heart rate value was obtained.

A series of maximal voluntary isometric exertions were performed to elicit maximal EMG signal amplitudes for each muscle that could be used for normalizing the data obtained during the stair descent tasks. These tasks were performed in postures that approximated the postures observed during pilot testing that occurred during the more physically demanding portions of the stair descent tasks. The maximal exertion task for the Erector Spinae muscles required participants perform a back-style lift from a position in which their torsos were flexed approximately 30°. The maximal exertions for each Latissimus Dorsi muscle were performed by having the participant sit with feet braced and pull backward on a handle located just above the knees. Bicep maximal exertions were performed with the participant standing upright and the elbow flexed approximately 80°. Anterior Deltoid maximal exertions were performed by having the standing participant pull upward on the dynamometers with the shoulder flexed approximately 30° and the elbow fully extended. Following the maximal exertions, the Lumbar Motion Monitor was placed on the participant’s back and baseline data were obtained as the participant stood in an upright neutral posture.

Where available, participants viewed instructional videos provided by the manufacturers of the sled devices. Where these were not available or the technique was not applicable, one of the investigators demonstrated how the device should be used. The participant then practiced descending the stairs with the training mannequin in each of the sleds. For the four two-evacuator devices, practice descents were performed in each position. This was done by having the participant and the assisting member from the investigative team switch places after three flights of stairs. These training descents included more flights of stairs than the actual measurement task to allow for added practice in each role with fewer elevator returns. Participants were instructed to remain close to the inside hand rail during the stair descents as this position makes it much easier to complete the 180° turn on the landing. Participants were also told they could use the handrail if they were so inclined, however, functionally all the tested devices required the use of both hands. This process allowed the participant to become familiar with the operation of each device, the simulated evacuation task, and the data collection procedures including the Borg scale.

Data collection trials were initiated by one of the investigators who reminded the evacuators that this was an “urgent” evacuation condition and a repeating recorded message was played stating “this is an urgent condition” for the duration of the stair descent task. During each evacuation trial the participant descended three flights of stairs and moved through two landings. A time marker was manually used to differentiate in the data stream when the participant was on the stairs versus on the landings. This same time marker was used to obtain the descent duration data. At the completion of each descent the participant’s heart rate was obtained and the participant was asked to provide a rating of
perceived exertion. A nearby elevator brought the participant and the sled (with training mannequin) back to the initial starting level. Descent tasks were separated by at least five minutes to minimize fatigue development.

Following the stair descent tasks, each participant participated in a structured interview where open-ended questions were asked that aimed at identifying usability issues with the devices as well as identifying features of each device that facilitated or hindered completion of the task. These interviews typically lasted 10–15 min during which the participants were shown photographs of the devices to facilitate comments specific to each device.

2.5. Data analysis

For each participant, raw EMG signals were processed using a Matlab program that employed high and low pass filters of 25 and 450 Hz, respectively. Data were rectified and smoothed with a moving average window of 150 ms (Hanning filter). The processed EMG data from each muscle were normalized to their maximum values obtained during maximum isometric contractions. Timing marker data were used to extract data during flight and landing. Given that the task on the stairs is largely a static exertion of the back and the arm muscles, the normalized EMG data were averaged.

<table>
<thead>
<tr>
<th>Sled Device</th>
<th>Description</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric Mat</td>
<td>This sled provides a padded mat for the occupant and cocoons the occupant using Velcro straps. Evacuations with this sled require two people.</td>
<td>![Fabric Mat Image]</td>
</tr>
<tr>
<td>Corrugated</td>
<td>This was one of the less expensive evacuation devices and is constructed from a coated corrugated material. Evacuations with this sled require two people.</td>
<td>![Corrugated Image]</td>
</tr>
<tr>
<td>Roll-up</td>
<td>This plastic sled, which can be rolled up when not in use, has a relatively low coefficient of friction. It has a long strap at the head end that can be used to delay the occupant down flights of stairs or grasped as a handle. This sled requires two evacuators.</td>
<td>![Roll-up Image]</td>
</tr>
<tr>
<td>Inflatable</td>
<td>This is a multipurpose device that can be used to evacuate individuals from high-rise buildings. The device inflates quickly using the accompanying pump. Only the bottom two of the four chambers were inflated for the stair descents per manufacturer instructions. Two evacuators required.</td>
<td>![Inflatable Image]</td>
</tr>
<tr>
<td>Hard Shell</td>
<td>This sled has a rigid construction with ball rollers underneath to facilitate travel on flat surfaces. The device requires the occupant be in a reclined sitting position. Only one evacuator is required.</td>
<td>![Hard Shell Image]</td>
</tr>
<tr>
<td>Wheeled</td>
<td>This sled is constructed with rollers under the torso to facilitate movement on flat surfaces and a high friction material under the legs to slow the descent. A single evacuator descends the stairs in front of the device and pushes down on the front part of the sled to engage the high friction material and slow the descent. The front part under the occupant’s legs is lifted on the flat surfaces to take advantage of the wheels under the torso.</td>
<td>![Wheeled Image]</td>
</tr>
</tbody>
</table>

Fig. 1. Descriptions of the six sled devices used in this investigation.
over the sample obtained from each flight of stairs. Due to the asymmetric handling of some sleds, the muscle from each bilateral pair with the largest mean value while descending the stairs was used in the analysis. In addition, this mean value was multiplied by the average stair flight duration across the three flights to yield an integrated EMG value (mean activity* stair flight duration).

For the landing data, the 90th percentile EMG values from each of the landing samples were obtained and then averaged across the two landing samples. The largest averaged 90th percentile landing response for each bilateral muscle pair was analyzed. The rationale for using the 90th percentile on the landing was that we anticipated there would be short peaks in the EMG activity as the participant transitioned on to or off of the landing, or as they made the 180-degree turn that would be washed out if the mean value was used.

As spine postures measured with the LMM were relatively consistent while on the stairs, mean values for the forward bending, lateral bending, and twisting obtained for each flight of stairs and averaged for each participant. The peak postural deviations from neutral across the two landings were used in the analysis of variance procedure.

Other computed measures included percentage of maximum heart rate and stair descent speed. Heart rate data were scaled relative to anticipated maximal heart rate (220 − age) and converted to a percentage. Descent speed was based on the distance traveled along the stairs and the distance traveled on the landings (Peacock et al., 2012).

Analyses of the wall contact was done by reviewing the video for each participant. Wall contact was defined as significant contact between the evacuator and the wall or the sled and the wall that could easily be seen and/or heard on the video. Minor contact, for example a light touch of the wall panel or railing would really not be a usability concern of evacuators.

In the statistical analysis of the heart rate, EMG, and trunk posture data, each of the 10 device-role combinations was considered as a different level of the “device/role” independent variable. Therefore, the two-way analyses of variance (ANOVA), which were blocked on subjects, were conducted for each of these dependent measures to assess the effects of the two independent variables: devices/role combination and the staircase width, plus their interactions. Separate ANOVAs were conducted for the EMG and the trunk kinematic data collected on the stairs and on the landings. The ANOVA for the descent speed used average descent speeds across roles and therefore evaluated the six devices and the two staircase widths. The Ryan, Einot, Gabriel, Welch q (REGWQ) procedure within SAS (version 9.3) was used for post-hoc tests to further evaluate significant differences between means.

3. Results

Table 1 summarizes the outcomes of the statistical tests used across the different measures sampled in this study.

<table>
<thead>
<tr>
<th>Location</th>
<th>Measure type</th>
<th>Measure</th>
<th>Device/role Width</th>
<th>Device/role Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stairs</td>
<td>Muscle</td>
<td>Erector Spinae</td>
<td>.001 NS</td>
<td>.003 NS</td>
</tr>
<tr>
<td></td>
<td>Latissimus Dorsi</td>
<td>&lt;.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bicep</td>
<td>&lt;.001 NS</td>
<td>.005 NS .008 NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deltoid</td>
<td>&lt;.001 NS</td>
<td>NS &lt;.001 NS</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>Forward bending</td>
<td>&lt;.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>Lateral bending</td>
<td>.005 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Twisting</td>
<td>.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td>Stairs</td>
<td>Speed</td>
<td>&lt;.001 NS</td>
<td>&lt;.001 NS NS</td>
<td></td>
</tr>
<tr>
<td>Landing</td>
<td>Heart rate</td>
<td>% Max heart rate</td>
<td>&lt;.001 NS</td>
<td>.001 NS</td>
</tr>
<tr>
<td>Posture</td>
<td>Borg scale rating</td>
<td>&lt;.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td>Landing</td>
<td>Muscle</td>
<td>Erector Spinae</td>
<td>.014 NS</td>
<td>.025 NS</td>
</tr>
<tr>
<td></td>
<td>Latissimus Dorsi</td>
<td>&lt;.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bicep</td>
<td>.001 .008</td>
<td>.018 NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deltoid</td>
<td>&lt;.001 NS</td>
<td>NS NS</td>
<td></td>
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<tr>
<td>Spine</td>
<td>Forward bending</td>
<td>&lt;.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>Lateral bending</td>
<td>.001 NS</td>
<td>NS NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Twisting</td>
<td>.002 NS</td>
<td>NS NS</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2. The average descent speeds measured with each evacuation device. These values include data collected on the flight as well as on the landings. Bars connected by a horizontal line above were not significantly different in the post-hoc test. Error bars represent standard error of the respective means.

The horizontal lines in Fig. 3. Generally, the subjective ratings of physical exertion followed a similar trend to the heart rate data (line chart in Fig. 3). While not statistically different from the other devices, the two single evacuator devices did show the highest physiologic workload. Across the four devices using two evacuators, there was no consistent difference regarding which role had higher physiologic demands. Relative to the narrow 1.12 m wide stairs, the average heart rate was six percent lower on the 1.32 m wide stairs.

3.3. Analysis of the EMG data collected on the stairs

Fig. 4 shows the Erector Spinae use on the stairs was lowest for the evacuator in the follower role when using the Fabric Mat. The remaining device-role combinations had very similar Erector Spinae activations. When considering the cumulative loading on this muscle the product of the mean Erector Spinae activation on the stairs and the stair duration times indicate that the Wheeled device required a significantly larger sustained effort (Fig. 4). The width of the stairs only affected three specific device/role conditions. Relative to the 1.32 m wide stairs, the 1.12 m wide stairs increased the...
Fig. 3. The heart rate (bars) and ratings of perceived exertion (line) by device and evacuator role. The data have been averaged across stair width conditions. Heart rates connected by the horizontal lines above the bars are not statistically different. Error bars represent standard error of the respective means.

Fig. 4. The time averaged Erector Spinae response (upper chart) and the time integrated EMG response (lower chart) on the stairs as function of the device type and the role of the evacuator. Bars connected by a horizontal line above were not significantly different in the post-hoc test. Error bars represent standard error of the respective means.
Erector Spinae activation for the Fabric-mat/Follower and decreased the Erector Spinae activation for the Inflatable/Leader and the Wheeled device.

The mean values for the Latissimus Dorsi and Bicep while descending the stairs are shown in Fig. 5. Even though the statistical analyses indicated significant differences across devices \((p < .001)\), overall the use of the Latissimus Dorsi was relatively low despite the task requiring that the follower pull back to slow the descent and the leader to pull forward to initiate the descent. Few differences were detected with post hoc tests.

With the exception of the two single operator devices, the Biceps activations on the stairs were relatively modest with most devices requiring activation levels less than 15 percent MVC. The higher bicep activation with the Wheeled device was associated with the tendency to pull up on the strap with one arm while pushing down on the occupant’s legs with the other arm. Across the device/role conditions, the wider stairs reduced the bicep activations by approximately 2 percent MVC.

The Deltoid muscles for the most part had very low activation levels while on the stairs with the exception of when the Wheeled device was used. With this device there was significantly more Deltoid activation \((p < .05)\) as the participant stabilized their arm while pushing down on the device to engage the higher friction material and slow the rate of descent.

### 3.4. Analysis of EMG data collected from the landings

For the landings, the analysis focused on the muscle within each bilateral pair that had the higher 90th percentile activation level. Overall, the devices affected the recruitment of all four of the sampled muscle groups. While a significant effect for the device and role combinations were found for the Erector Spinae, all the 90th percentile activations were between 30 and 37 percent MVC and showed only minor differences across devices. The significant width by device/role interaction was due to a significant reduction in the follower’s Erector Spinae activity when using the Roll-up device while on the 1.32 m-wide landing relative to the activation on the 1.12 m-wide landing. A similar trend was seen in the follower’s Erector Spinae activation when using the Fabric Mat device \((p < .10)\).

Fig. 6 shows that both the Latissimus Dorsi and the Bicep muscles showed a range of activations across devices and roles while on the landing. For the Latissimus Dorsi, the leader roles had the higher activations as most of the effort to pull the sled through
the landing was supplied by the person in this position. For the Bicep muscles, those in the follower role with the two-person evacuations had higher Bicep activation levels than did the leaders. This was particularly true for the follower position with the fabric mat, inflatable, and Roll-up devices with the 1.12 m stair conditions. Frequently the individuals in this role were trying to lift slightly to facilitate turning the corner. This happened more with the 1.12 m wide stairs than with the 1.32 m wide stairs, hence the significant device/role by staircase width interaction effect.

The Deltoid muscles were also activated in the landings, and like the Biceps, with some of the largest activations associated with the follower role as they tried to assist the leader with the landing maneuvers (Fig. 7). Overall, staircase width did not affect Deltoid recruitment, nor did staircase width selectively affect certain device/role combinations.

3.5. Trunk motion analysis

On the stairs the trunk postures consisted primarily of some degree of forward flexion. The average amount of lateral bending and twisting was less than five and seven degrees, respectively. The forward bending was significantly larger with the wheeled device, averaging 43°. On the other hand the follower role with the fabric mat and the corrugated device had the least flexion, 15 and 17° respectively. The differences between the remaining device/role combinations were smaller and showed little in the way of statistical differences.

On the landings the same trends in the forward flexed postures from the stairs were continued, however, the forward flexion associated with the wheeled device increased to 60°. There was less than 12° of lateral bending for all devices. The amount of twisting ranged between 6 and 12°. The lowest values were found by those leading the two-person devices through the landings, whereas the highest values were found by those following the two-person devices through the landings.

3.6. Usability analysis

For both stair widths, the number of contacts with the wall varied significantly (p < .005) across the devices. Fig. 8 shows the contact rates for the narrower, 1.12 m wide stairs and landings as a function of four wall panel locations (see inset in Fig. 8). The Wheeled sled had the highest contact rate, mostly with wall panels 1 and 2 on the entry side of the landing. These contacts were
primarily the head end of the device as it slid off the stairs onto the landing. The side of the Inflatable tended to contact the wall panels across from the stairs during the turn. The lowest contact rate during the 1.12 m condition was when the Fabric Mat was used. For the Inflatable and Wheeled, the contact rates were reduced with the wider stairs and landings ($p < .05$). It should be noted that with the 1.32 m stairs and landing, there was no contact with the walls when the Fabric Mat and the Hard Shell were used, and very few contacts when the Roll-up and Corrugated were used.

Following the stair descent tasks the participants were interviewed and asked to identify design features or characteristics of each device that they liked and disliked. The results of these interviews are summarized in Table 2. In general, this group of experienced evacuators identified as positive design features the length and size of the handle straps on the Corrugated and Fabric Mat devices and the relative ease the Corrugated, Fabric Mat, and Roll-up devices could be maneuvered around the corner on the landing. As for negative design features, some participants thought the length of the Corrugated device increased the difficulty of making the corner. Negative design features with the Hard Shell included the length of the strap, that it felt as though the strap could slip, and the difficulty controlling and turning the device. Concerns were expressed about the Inflatable device being heavy and having a tendency to tip on the corners. Comments concerning the Roll-up focused on the fact that the material could potentially slide too fast. Negative design features for the Wheeled device focused on the position of the single evacuator in front of the device on the stairs and the way the evacuee’s head swings on the landing. Overall, about half of this sample of evacuators would recommend the Corrugated, Fabric Mat, and the Roll-up for fire service use. A slightly larger proportion would recommend these same devices for purchase by building owners.

4. Discussion

The comparison of six sled-type evacuation devices has highlighted several different design features across these devices and their biomechanical effects on the evacuator. Overall, the Fabric Mat, Corrugated, and Roll-up devices allowed for quicker evacuations and were perceived as easier to use. It should be noted that none of the devices tested showed stair descent speeds that were consistent with the pedestrian evacuation speed data reported by Peacock et al. (2012) and Ma et al. (2012). These slower speeds indicate that the evacuation of individuals from high rise buildings with any of these devices would create a bottleneck in a mass evacuation scenario. With all of the devices tested in this study, the slowest movement was through the landing. This is particularly important as it is the landings where the bottlenecks in the evacuation flow typically occur, especially as more individuals are merging into flow from different floors (Galea et al., 2008). This would be even more important with narrower staircases, as we found this further slowed the overall speed of descent. One could argue that the slow descent speeds were due to the lack of experience with these types of devices. However, one could also argue that this level of inexperience should be expected given the limited use of these types of evacuation devices by fire service personnel. Likewise, other healthcare personnel who work in the facilities that have purchased these devices would be expected to have limited practice opportunities with the devices. Consequently, slow evacuation speeds with sled-type devices relative to normal pedestrian egress should be expected.

Two of the slower devices were operated by a single evacuator. If used in a medical facility where pedestrian egress may be less important, due to the lower density of mobile building occupants,
the allocation of a single evacuator per evacuee may be a much more efficient process overall if several patients need to be evacuated. The heart rate and ratings of perceived exertion data indicate that while these two single evacuator evacuation devices have the largest physiologic demands, the overall magnitude was less than that found with two-person hand-carried devices (Lavender et al., 1985), therein confounding the interpretation of these signals. The spine posture and muscle recruitment data, on the other hand show the Wheeled device, largely due to the slower descent rate and the sustained forward flexion, has significantly higher time-integrated levels of Erector Spinae use, therein suggesting localized muscle fatigue could be a factor in longer multi-story evacuations. Manion and Golden (2004) estimated that six to seven evacuators per intensive care unit patient would be needed when the patients are hand-carried on litters. Therefore, any of these devices would allow for more efficient transport than current methods.

Overall, the Erector Spinae recruitment data on the stairs are clearly less than that observed with hand-carried evacuation devices (Lavender et al., 2013) and are similar to those seen with track-type devices (Mehta et al., 2015). On the landings, the muscle activation levels were of similar magnitude to those seen with the hand-carried devices, indicating that this is the more physically demanding component of the task. Unlike when using hand-carried devices, it is easy for evacuators to pause and rest for a period of time on a landing. Setting down hand-carried devices and lifting again to resume an evacuation requires additional exertions.

Specific sled design features and how the may have affected the data are worthy of review. First, the coefficient of friction affected how much effort was required to control the speed of descent, and therefore the muscle use on the stairs, for example, the low Erector Spinae and Latissimus Dorsi use with the Fabric Mat on the stairs. Clearly, there needs to be balance as the higher coefficient of friction of this same device was associated with the highest Latissimus Dorsi use on the landing. The wheels and rollers on the Wheeled and Hard Shell devices were specifically aimed at easing the movement on horizontal surfaces. The data does not show a direct benefit of using the wheels and rollers in these devices due to other issues that most likely masked the potential benefit of these design features. Second, the overall size of the device affected the wall contact and the ratings of perceived exertion. The Fabric Mat, which could be shortened to match the stature of the occupant by pulling one cinch strap, had the fewest wall contacts on the landing. This was closely followed by the Hard Shell sled, which also had a shorter overall length. Third, the type of interface with the evacuator was found to be significant in the post trials interviews. The simple straps with clear demarked hand-holds in the Corrugated and Fabric Mat devices were favorably noted in the post study interviews. These two devices were also the two devices with the lowest ratings of perceived exertion. The strap on the Hard Shell, by wrapping around the waist, transferred loads directly to the pelvis and should have reduced the bending moments on the spine and muscle use. However, the participants still flexed forward on average 22° when using this device and tended to pull back on the strap therein using the muscles at levels similar to those found with the other devices. This could be explained by the comment made by some participants that the strap was made of a material that the participants thought could slip. Fourth, while the biomechanical data supports the use of the inflatable device, one concern with this device is the availability of electric power necessary to operate the pump in these evacuation situations.

In sum, when choosing a device, it appears that the sleds using two evacuators and those with handles integrated into the straps should receive strong consideration. Given that evacuators have may have very limited experience or training with these devices, having affordances in designs, such as integrated handles, will be useful for guiding unfamiliar evacuators towards proper operation of the device when needed. Devices that cocoon the occupant, in addition to protecting the occupant from wall contact, serve to minimize the device width and facilitate turns on the landings. Likewise, devices that can be shortened in overall length to match the stature of the evacuee also make the turns on the landing easier. For those who design and manufacture these devices, it may be worthwhile to look into how the coefficient of friction can be maintained on the stairs and reduced on the landings.

There are several limitations to this analysis that should be acknowledged. First, we do not have any assessment of occupant comfort. However, all of these devices would be better than the “blankets or sheets” (Schultz et al., 2003) used in the evacuation of hospitals following the Northridge, CA earthquake. One concern with the Corrugated, Roll-Up, Fabric Mat, and Wheeled devices was the possible extension of the occupant’s spine as these devices were transitioned from the landing to the actual flight of stairs. To maintain patient comfort, a coordinated action of elevating the legs and tipping up the torso needs to be practiced by the evacuators.

Second, these devices were evaluated with relatively short three-flight evacuations. This was done to manage participant fatigue levels given that each participant was being asked to perform 20 descents in addition to the six training descents. The cumulative fatigue effect that would be encountered with longer evacuations from large high-rise structures has to be considered. Relatively small differences in muscle recruitment levels may still affect the fatigue rate and the ability for the evacuators to effectively control the device. Moreover, localized fatigue in the muscles sampled alters the characteristics of the EMG signal (Basmajian and De Luca, 1985), therein confounding the interpretation of these signals.

### Table 2
Positive and negative comments from the participants addressing the usability of each sled device used in the study.

<table>
<thead>
<tr>
<th>Device</th>
<th>Corrugated</th>
<th>Fabric mat</th>
<th>Hard shell</th>
<th>Inflatable</th>
<th>Roll-up</th>
<th>Wheeled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive design features</td>
<td>2-Handle straps – good length, Easy to get around corner, Low profile</td>
<td>Wide Strap - Good length, Good Friction, Easy to get around corner</td>
<td>None</td>
<td>None</td>
<td>More rigid – less lateral swing, Easy to get around corner</td>
<td>Friction from material</td>
</tr>
<tr>
<td>Negative Design Features</td>
<td>Length makes getting around corner tough, Lack of control</td>
<td>Strap to long, Strap could slip</td>
<td>Hard to turn, Hard to get around corner</td>
<td>Top heavy- tendency to tip</td>
<td>Could slide too fast, Long thin strap difficult to grip</td>
<td>Position of single evacuator in front of patient/Bending, Awkward to push down on patient's legs</td>
</tr>
<tr>
<td>% that would Recommend to: Fire service/Building owners</td>
<td>42%/67%</td>
<td>50%/58%</td>
<td>0%/25%</td>
<td>0%/25%</td>
<td>58%/58%</td>
<td>81%/25%</td>
</tr>
</tbody>
</table>
Third, female participants were not included in the sample. The research was open to female participants, however, none volunteered. There were few female firefighters in the fire departments recruited which is consistent with the national average (Karter and Stein, 2013).

Fourth, the participants performed the evacuation tasks in comfortable clothes to help maintain a normal body temperature. This was necessary, to prevent fatigue and to minimize the perspiration that results in electrodes falling off. The downside of this methodological decision is that many times firefighters would be performing these evacuations in heavy turnout gear. Our hypothesis is that had the experiment been conducted in full turnout gear the overall levels of the response variables would have been elevated, but the relative differences between devices would be of a similar magnitude.

Fifth, tape marks, as opposed to moveable wall panels, were used along the stairway to “narrow” the staircase width. Therefore, any psychological effect and resulting behavioral change due to the visual narrowing of the stairs was not considered in this study. However, given that the participants were instructed to remain close to the inside rail on the stairs, as this facilitated the turn on the landing, and pilot testing showed that while on the stairs the participants were not close to crossing the tape marks, moveable wall panels were not used.

Fifth, the weight of the evacuee was only 73 kg. Consistent with the CDC’s report on obesity (CDC, 2012), many of the participants were not close to crossing the tape marks, moveable wall panels were not used.

Sixth, the participants in the current study were instructed to descend the stairs along the inside rail to maximize the space that would be available for making the turn on the landing. This could potentially be problematic if there was upward bound foot traffic (i.e., additional firefighters) at the same time as was true during the World Trade Center evacuation (Sheilds et al., 2009).

Seventh, the maximum width of the widest stair condition used in this study was 10 cm less than what is called for in the NFPA code for buildings with greater than 2000 occupants. However, while we found differences between our two staircase widths for some of our measures, it is unlikely that these results would have changed significantly had the stairs, and more importantly the landings been 10 cm wider.

Eighth, the assumption behind this evaluation is that the devices are in place and ready to use. We did not evaluate the time to set-up the devices in preparation for use, nor did we assess the physiologic demands experienced if an evacuator needed to transport the device to the scene by carrying it up multiple flights the stairs.

5. Conclusion

Looking across the tested devices, there are significant differences with regards to evacuation times and the physical demands placed on the evacuators during stair descents. Based on these findings, we recommend two-person devices with handles integrated into the straps, including the inflatable if the availability of electric power can be assured. Devices that cocoon the occupant and can be shortened in overall length to match the stature of the evacuee facilitate movement through the landings and minimize wall contact. In sum, these data suggest that it is equally important to consider how easy it is to control the descent on the stairs and how much effort is required to work a device through a landing.

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Evaluating the physical demands on firefighters using track-type stair descent devices to evacuate mobility-limited occupants from high-rise buildings

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A B S T R A C T

The physical demands on firefighting personnel were investigated when using different types of track-type stair descent devices designed for the emergency evacuation of high-rise buildings as a function of staircase width and evacuation urgency. Twelve firefighters used five track-type stair descent devices during simulated urgent and non-urgent evacuations. The devices were evaluated under two staircase width conditions (1.12, and 1.32 m), and three devices were also evaluated under a narrower staircase condition (0.91 m). Dependent measures included electromyographic (EMG) data, spine motion, heart rates, Borg Scale ratings, task durations and descent velocities. Stair descent speeds favored the devices that had shorter fore/aft dimensions when moving through the landing. EMG results indicated that there were tradeoffs due to design features, particularly on the landings where the physical demands tended to be greater. On the landings, devices that could be rolled on four wheels reduced the deltoid and bicep activation levels.

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1. Introduction

Firefighters/paramedics and emergency medical service (EMS) providers are frequently engaged in transporting patients down flight of stairs. In fact, when asked to indentify frequently performed strenuous work activities, Conrad et al. (2000) found that several of the identified activities included transporting patients down flights of stairs using various pieces of equipment, including stair chairs. In addition to the routine transporting of patients out of residences, fire service personnel are typically among the first responders called to assist in evacuating large multi-story buildings during both emergency and non-emergency conditions, for example, extended power outages. During such evacuations, the first responders may need to transport building occupants with mobility impairments down several flights of stairs. Clearly, the transporting of people can be very physically demanding (Lavender et al., 2000; Fredericks et al., 2002) and there is epidemiological evidence that such tasks performed by EMS workers are often associated with injury development (Gershon et al., 1995; Hogya and Ellis, 1990; Karter and Molis, 2011; Maguire et al., 2005). Furber et al. (1997) in their study of 477 workers compensation claims, specifically found that stair transport within private residences was a strong factor contributing to injuries reported by ambulance officers.

Different types of equipment are available to assist first responders in transporting individuals down flights of stairs. Most common are hand-carried stair chairs. These are minimally carried by two individuals, and depending on staircase width, patient weight, and first responder availability, carried by as many as four individuals. Prior work in this field has documented stair descents with such hand-carried chairs to be a physically demanding task (Lavender et al., 2000; Fredericks et al., 2002; Lavender et al., 2013). Specifically, Lavender et al. (2013) reported Erector Spinae activation for the “follower” position during two-person stair descents that included two landings using three hand-carried devices to evacuate a 73 kg occupant. The mean values on the stairs, averaged
across participants, ranged between 25 and 34 percent MVC. The 90th percentile values obtained on the landing, averaged across participants, ranged between 33 and 43 percent MVC. The heart rates measured at the completion of these stair descents ranged from 36 to 48 percent of the participant’s age-adjusted maximum heart rate. Moreover, hand-carried evacuation devices, particularly those where the lead evacuator must descend the stairs walking backwards, have stair descent velocities that are slow relative to published pedestrian evacuation speeds (Peacock et al., 2012) and backwards, have stair descent velocities that are slow relative to published pedestrian evacuation speeds (Peacock et al., 2012) and therefore may disrupt evacuation flow in emergency situations (Lavender et al., 2013).

Within the last decade, track-type stair chairs have become more prevalent. These pieces of evacuation equipment eliminate the need for lifting/carrying and instead have evacuators gliding or rolling the chairs down the stairs on long tracks that bridge two, possibly three stair nosings, thereby reducing the load experienced by the evacuator (Fredericks et al., 2002) and improving the evacuation speed (Adams and Galea, 2010). While several track-type devices are currently on the market for emergency evacuation of individuals with motor disabilities from high rise buildings, little empirical data exists that indicates their relative impact on the physical demands experienced by the first responders across the different track-type stair chair designs. Previously, Fredericks et al. (2002) showed that the use of track-type devices reduced the risk to back injury relative to hand-carried devices. Moreover, subtle changes in the track-type stair chair design had substantial effects on the physical demands, as evidenced by the variations they observed in their compressive and shear force estimates (Fredericks et al., 2006). However, Fredericks et al. (2006) did not obtain data as the chairs were maneuvered through a landing. Previously, Lavender et al. (2007) reported greater physical demands were experienced by the research participants while on the landing as compared to when they were on the flight of stairs. Evacuation conditions including the staircase width and the urgency of the evacuation may also impact the physical demands on the first responders, particularly if the stair descent involves landings where the direction of travel changes. Drury (1985) provided evidence that task performance measures, for example task duration or movement speed, are dependent upon the available space, at least up to the point where space no longer potentially restricts movement. Likewise, Karwowski and Hashim (1991) reported a trend toward a lower acceptable weight of lift with more restricted lifting spaces. This implies that staircase dimensions could impact performance measures and muscle recruitment levels as track-type stair chairs are maneuvered through smaller versus larger landings. As for urgency, several studies have shown increases in biomechanical loading as movement speed increases (Marras, 2008). Under urgent evacuation conditions, one could expect more rapid motions, and perhaps more co-contraction of antagonistic muscles as the body is stabilized under the increased dynamic external loads.

Therefore, the objectives of this study were to compare the physical demands experienced by seasoned fire service personnel and their usability experiences when using five existing evacuation chairs with track systems, each representing a different design approach that has been developed to transport individuals who are ill or who have ambulatory disabilities down multiple flights of stairs of varying widths. Specifically, the following hypotheses were tested:

1. There are significant differences among existing evacuation device designs with regards to the physical demands placed on firefighters as measured with objective heart rate and electromyographic measures, as well as with subjective measures of perceived exertion.
2. There are differences in occupant evacuation times across evacuation devices.
3. The physical demands on the evacuator increase with narrower staircases.
4. The physical demands on the evacuator increase when there is a sense of urgency.

Additionally, the study assessed usability issues with each of the evaluated devices through video analysis and a structured interview process.

### 2. Methods

#### 2.1 Participants

Twelve male professional firefighters between the ages of 24 and 61 (mean = 36 years) were recruited for this study. Mean height and weight were 1.83 m (1.75–1.96 m) and 87.7 kg (70.7 kg–111.1 kg). The fire service experience ranged from 1.5 to 23 years (mean = 9 years). All participants signed a consent document approved the The Ohio State University’s Institutional Review board.

#### 2.2 Experimental design

A repeated measures randomized block experimental design was used in which participants experienced all tested combinations of the five evacuation devices (Fig. 1), the three staircase widths, and the two urgency conditions (urgent and non-urgent). Participants were asked to descend three flights of stairs and proceed through two landings under each experimental condition. As participants performed this task, dependent measures were obtained that included task performance measures, levels of muscle recruitment, spine kinematics, and physiologic demands. Task performance measures were comprised of overall task duration, stair descent velocity, and time required for strapping the occupant in the chair. Muscle recruitment was assessed using surface electromyographic (EMG) signals sampled bilaterally from the Erector Spinae, Latissimus Dorsi, Deltoid, Biceps and Triceps muscles. Three-dimensional spine postures while the participants descended the stairs and moved through the landings were assessed using a Lumbar Motion Monitor (LMM) (Chattanooga Group, Chattanooga, TN, USA). Physiologic demands were obtained by sampling the heart rate and ratings of perceived exertion (Borg Scale) at the completion of each condition. Maneuverability, one aspect of usability, was assessed using a camera mounted above one of the landings requiring a 180° turn. In addition, other usability issues were assess through structured post-study interviews.

NFPA 101-2009 code specifies staircase widths based on building occupant load. Specifically, this study evaluated stair descent tasks performed under the following stair case widths: 0.91 m (building occupancy < 50), 1.12 m (building occupancy < 2000), and 1.32 m (approximates the 1.42 m required for ≥2000 occupants). Data collection in the experiment was blocked on the three staircase widths. However, two chairs, the Long-track and the Rear-facing, were not used during the 0.91 m condition on account of their overall length. Within each staircase width, the order that the chairs were used was randomized. The sequence of “urgent” versus “non-urgent” conditions with the stair descent devices was counter-balanced across participants.

#### 2.3 Apparatus

The chair occupant was a training mannequin having a mass of 73 kg. The five chairs selected for this study are shown in Fig. 1.
<table>
<thead>
<tr>
<th>Stair Descent Devices</th>
<th>Rationale for Inclusion</th>
<th>Key Dimensions</th>
<th>Image</th>
</tr>
</thead>
</table>
| Narrow                | This chair was only 38 cm wide and therefore presented a narrower option that would potentially work better on narrower staircases. The four wheel configuration allows it to be rolled through stair landings. | Track length: 71 cm  
Overall length: 106 cm  
Overall width: 52 cm  
Handle Heights: 14.8 cm  
Handhold width: 23 cm  
Mass: 16 kg  
Landing exertion: push forward | ![Image](image1.png) |
| 2-Wheel               | This chair has two wheels in front which means that the operator supports the occupant as it is rolled through landings, although rear wheels can be deployed for longer horizontal travel distances. | Track length: 72 cm  
Overall length: 77 cm  
Overall width: 53 cm  
Handle Heights: 127 cm  
Handhold width: 39 cm  
Mass: 9 kg  
Landing exertion: Lift & push forward | ![Image](image2.png) |
| Standard              | This chair is similar to many of the track-style evacuation chairs currently used by fire departments. | Track length: 72 cm  
Overall length: 97 cm  
Overall width: 52 cm  
Handle Heights: 161, 144, 128, 112, 95 cm  
Handhold width: 37 cm  
Mass: 17 kg  
Landing exertion: push forward | ![Image](image3.png) |
| Long-Track            | This chair has been developed with and marketed to those in the disability community. The occupant is in a more reclined posture. The tracks have a speed governor and a braking mechanism. The chair is long which limits its use on narrow staircases due to restricted movement on the landings. The chair is turned on landings by pushing down on the handle. | Track length: 89 cm  
Overall length: 128 cm  
Overall width: 42 cm  
Handle Heights: 82 cm  
Handhold width: 39 cm  
Mass: 21 kg  
Landing exertion: push down and forward | ![Image](image4.png) |
| Rear-Facing           | This is the only chair tested where the occupant faces backwards, facing the operator. The chair is long which limits its use on narrow staircases due to restricted movement on the landings. The chair is turned on the landings by tipping forward and balancing the occupants weight across the front wheels and the lower handles. | Track length: 99 cm  
Overall length: 165 cm  
Overall width: 63 cm  
Handle Heights: 78 cm  
Handhold width: 44 cm  
Mass: 14 kg  
Landing exertion: Lift & push forward | ![Image](image5.png) |

Given the occupant weight and that the National Fire Protection Association (NFPA) Life Safety Code indicates that when descending stairs, an evacuation device should be easily operable by one person who is trained on its use, and that above average weight or strength should not be required for proper operation (NFPA 101-2009 Annex, A.7.2.12.2.3(2) (8)(a)), that these track-type chairs were operated by a single person.

The staircase was 1.32 m wide and the corresponding landings were 1.32 m deep. The width of the staircase and the depth of the landing were narrowed using tape lines and partitions placed on the landings to simulate the 0.91 and 1.12 staircase widths. The rise and run of each step was 0.17 m and 0.28 m, respectively.

EMG data were obtained using a Delsys (Boston, MA) wireless EMG system sampled at 1000 Hz. Heart rate data were sampled using a chest-band transmitter unit that displayed data on a wristwatch (Polar Electro, Inc., Model FS1, Lake Success, NY). The participants were polled as to their perceived level of effort at the completion of each stair descent using a 10-point Borg-type rating system (Borg, 1982).

Two video cameras captured each stair descent task. One of the investigators followed the participant down the stairs and through each landing while holding a video camera. The second video camera was positioned above the first landing to obtain overhead views as the chairs were maneuvered through the landing to provide data for the usability analysis.

### 2.4. Procedures

After signing an IRB approved informed consent document, the volunteers were prepared for the study by placing surface EMG electrodes bilaterally over the: (1) Erector Spinae muscles at the L3 level approximately 5 cm from the midline; (2) the Latissimus Dorsi muscles at the T7 level approximately 13–15 cm from the midline; (3) the belly of the Anterior Deltoid muscles; (4) the belly of the Bicep muscles; and (5) the belly of the Tricep muscles. A baseline sample of the EMG activity during quiet standing (resting EMG) was obtained. The heart rate monitor was strapped on the chest and a resting heart rate value was obtained.

A series of maximal voluntary isometric exertions were performed to elicit maximal EMG signal amplitudes for each muscle that could be used for normalizing the data obtained during the stair descent tasks. These tasks were performed in postures that approximated the postures observed during pilot testing that occurred during the more physically demanding portions of the stair descent tasks. The maximal exertion task for the Erector Spinae muscles required participants perform an isometric back-style lift from a standing position with their knees straight and their torsos flexed approximately 30°. This was accomplished by placing the handle of the strength testing equipment just above knee level and directing the participant into the appropriate posture. The maximal exertions for each Latissimus Dorsi muscle were
performed by having the participant pull backward and upward on a handle located at mid thigh level. Bicep maximal exertions were performed with the participant standing upright and the elbow flexed approximately 70°. Anterior Deltaoid maximal exertions were performed by having the standing participant pull upward on the dynamometers with the shoulder flexed approximately 30° and the elbow fully extended. Last, the Tricep maximal exertions were performed with the participant standing upright and pushing down on a handle with the elbow flexed about 90°. Following the maximal exertions, the Lumbar Motion Monitor was placed on the participant's back and baseline data were obtained as the participant stood in an upright neutral posture.

After viewing each of the instructional videos provided by the manufacturers of track-type stair chairs, the participant practiced descending the stairs with the track-type chairs and the training mannequin. This allowed the participant to become familiar with the operation of each chair, the simulated evacuation task, and the overall starting level. Descent tasks were separated by at least 15 min to allow the participant to transition on to or off of the landing, or as they as they made the 180° turn that would be washed out if the mean value was used. Heart rate data were scaled relative to anticipated maximal heart rate (220 – age) and converted to a percentage (Lamb, 1984). Two three-way analyses of variance (ANOVA), blocked on subject, were conducted for the velocity, duration, and EMG data collected from the landing. The first analysis looked at the 5 track-type stair chairs as they were operated on the 1.12 and 1.32 m wide stairs under the two levels of urgency. The second ANOVA focused on the three stair chairs that could be used with the narrower staircase widths and included the 0.91 m staircase width condition in addition to the two wider conditions as well as the two urgency conditions. The EMG data sampled while the participants were on the flights of stairs were only analyzed for the two wider staircase conditions. This was because with all of the devices, the participants were instructed to descend the stairs along the inside rail to facilitate making the turns on the landing. Thus, one would expect very little effect of the stair narrowing, but a much larger effect of the narrowing of the landing, particularly during the 0.91 m condition.

3. Results

3.1. Task performance

3.1.1. Staircase width – 1.12 and 1.32 m

Descent speed during the urgent conditions was significantly affected by the different descent devices and staircase width (p < 0.001). On average, the descent speed was significantly faster for the 2-Wheel chair as compared to the standard and narrow chair, which were significantly faster than long-track and rear-facing chairs (Fig. 2a). Descent speed is based on the distance traveled along the stairs and the distance traveled on the landings (Peacock et al., 2012). The time required to descend a flight of stairs was relatively short (range: 1.4 s – 1.9 s) as compared to the time required to maneuver through the landing (range: 5.9 s – 8.9 s). Thus, the descent speed was largely affected by the landing duration. Specifically, the three devices which were shorter in overall length, namely the standard, the narrow and the 2-Wheel devices, showed significantly shorter time on the landing as compared to the two longer devices (Fig. 2b). Stair case width showed no effect on the flight and landing duration data (p > 0.05), however, the overall descent speeds were significantly faster for 1.32 m wide staircase (0.72 m/s) as compared to 1.12 m (0.6 m/s) wide staircase (p < 0.05).

3.1.2. Staircase width – 0.91, 1.12 and 1.32 m

The effect of narrower staircase widths was also evaluated using the three track-type stair chairs that were usable on the narrowest width stairs and landing (0.91 m). Across the three devices, the narrow staircase width resulted in the slowest average descent speed (0.55 m/s), followed by the 1.12 m wide stairs (0.68 m/s),
which in turn was significantly slower than 1.32 m staircase width (0.8 m/s) \((p < 0.05)\). For 0.91 m stair width, descent speed was significantly slower \((p = 0.015)\) for the narrow (0.51 m/s) and standard (0.54 m/s) chairs as compared to the 2-wheel chair (0.58 m/s). Fig. 2c indicates the slower descent speed with the 0.91 m staircase width was primarily due to the amount of time required to maneuver on the landing. The significant interaction in the landing duration data between the staircase width and the three descent devices that could be used on the narrowest stair indicate counter-intuitively that the increased landing duration on the narrow stairs was largest for the “narrow” chair.

Strapping of the occupant on to the device was another measure to evaluate performance. The devices with a single strap (Narrow, Rear-facing and 2-wheel) allowed the occupant to be prepared faster (prep time approximately 13 s) than the devices with three straps (standard and long-track), which took approximately 39 s.

3.2. Physiologic demands

3.2.1. Staircase widths: 1.12 and 1.32 m

For the 1.12 and 1.32 m stair width, the overall physiologic demands, as assessed via heart rate, were lowest when using the standard chair (Fig. 3a). Perceived exertion ratings showed the firefighters participants found the standard, narrow and 2-wheel stair chairs were all “fairly easy” \((p > 0.05)\) and were, as a group, given significantly \((p < 0.05)\) lower perceived exertion ratings than those obtained from the rear-facing (“moderate”), which were significantly lower \((p < 0.05)\) than the perceived exertion ratings of long-track stair chair (“somewhat hard”) (Fig. 3b). Both the heart rate and perceived exertion data increased during “urgent” conditions but were unaffected by staircase width \((p < 0.05)\).

3.2.2. Staircase widths: 0.91, 1.12 and 1.32 m

Including the narrowest staircase width in the analysis of the data from the three stair chairs that could be used on the 0.91 m

![Figure 2](image_url)

**Fig. 2.** The descent velocity for the five descent devices during the urgent condition averaged across the 1.12 and 1.32 m stair widths (a), the total duration on the landing, averaged across stair widths, for the five devices (b) and total landing duration for three chairs that could be used on the 0.91 m wide stairs by stair width interaction (c). Error bars represent standard errors. The shaded band in the stair descent velocities represent the range of pedestrian stair descent velocities observed by Peacock et al. (2012) in their building evacuation trials. Bars connected by the same horizontal line are not statistically different as determined via post-hoc analyses.

![Figure 3](image_url)

**Fig. 3.** The percentage of each participant’s maximum heart rate recorded at the completion of the stair descent task for the 5 devices averaged across the 1.12 and 1.32 m stair widths (a) and the corresponding ratings of perceived exertion (b). Bars connected by the same horizontal line are not statistically different as determined via post-hoc analyses. Shaded regions represent the range of values observed across three hand-carried devices evaluated using a similar evacuation task (Lavender et al., 2013).
staircase width did not result in any differences in the heart rates \( (p > 0.05) \), but did result in ratings of perceived exertion being significantly higher \( (p < 0.001) \) due to the staircase width. Specifically, across the three track-type stair chairs tested, descending the 0.91 m wide stairs resulted in a higher rating of perceived exertion \( (rating = 2.6) \) as compared with the 1.12 and 1.32 m widths \( (both \ ratings = 2.2) \).

3.3. Analysis of EMG data from the stairs

3.3.1. Staircase widths: 1.12 and 1.32 m

Analysis of the integrated mean EMG activation levels while on the stairs showed that the evacuation devices significantly affected all the investigated muscle groups (Table 1a). No effect of staircase width was observed on the studied muscle groups \( (p > 0.05) \). All the muscle groups, except the Biceps, showed significant interaction between stair descent devices and urgency. The integrated EMG signals for the Erector Spinae were significantly larger for the \( 2 \)-wheel, narrow and rear-facing chairs as compared to the standard and long-track chairs (Fig. 4a). Fig. 4b shows that the narrow chair had the largest integrated EMG signals from the Latissimus Dorsi muscle as this device required the participants to hold back on the device during stair descent. On the other hand, the long-track chair, on account of its speed governor/braking mechanism, showed the lowest Latissimus Dorsi activation. However, the shoving action required to push the long-track chair off the final one or two steps of each flight led to the largest integrated EMG response of Deltoid muscles (Fig. 4c). The narrow and standard chairs showed significantly larger Tricep activation (Fig. 4d) on account of the need to push vertically downwards on the handles while performing the stair descent task so that the occupant would have a relatively smooth ride.

3.4. Analysis of EMG data from the landings

3.4.1. Staircase width – 1.12 and 1.32 m

For the landings, the analysis focused on the muscle within each bilateral pair that had the higher 90th percentile activation level. Overall, the devices affected the recruitment of the Latissimus dorsi, Deltoid, Bicep and the Tricep muscles (Table 2). However, the Erector Spinae muscle showed a significant device by urgency interaction. This interaction resulted from the urgent conditions having greater Erector Spinae activations as compared to non urgent conditions for all the chairs except the long-track chair. As shown in Fig. 5b, the Latissimus Dorsi activations on the landing were fairly consistent across the chairs except that the narrow chair had significantly larger activations than the \( 2 \)-wheel, long-track or standard chairs. This increased activation with the narrow chair was associated with the participants tipping the chair back as they prepared to start the next flight of stairs. Deltoid EMG activation for the narrow and standard chairs were significantly lower than the \( 2 \)-wheel chair, which were significantly lower than the long-track chair (Fig. 5c). Bicep activation was lowest for the long-track chair, which was significantly lower than the narrow and standard chairs. The \( 2 \)-Wheel chair showed the highest Bicep recruitment, followed by the rear-facing chair as both of these chairs required the participant to pivot the devices on two wheels around the landing while supporting a significant proportion of the occupant’s weight. Tricep activation was largest for the standard chair as the participants prepared for the next flight of stairs. The long-track requires the operator to push vertically downwards on the handle to turn and roll the chair on flat surfaces. This accounts for the elevated Tricep response relative to the chairs requiring the evacuator support part of the occupant’s weight and therein increase the Bicep activation. Landing width did not show any differential across the evacuation devices as evidenced by the non-significant device by width and device by urgency by width interactions \( (p > 0.05) \).

3.4.2. Staircase width: 0.91, 1.12 and 1.32 m

The analysis of the three chairs used with the three staircase widths yielded effects that were similar to those reported above for the two staircase widths, with the exception of the Deltoid activation which showed a significant staircase width by chair type interaction. This effect, shown in Fig. 6, highlights the additional recruitment of the deltoid when passing through the 0.91 m wide landing with the \( 2 \)-wheel and narrow stair chairs. Additionally, at 1.12 m staircase width, the deltoid muscle activation was significantly higher for the \( 2 \)-wheel stair chair as compared to narrow and standard stair chairs \( (p < 0.001) \).

3.5. Spine posture analysis

The stair descent task was generally sagitally symmetric, therefore the trunk postural deviations were primarily in the sagittal plane. Overall, there was very little side bending \( \text{range:} \, 4.5 \text{–} 111^\circ \) and twisting \( \text{range:} \, 3.2 \text{–} 13^\circ \). On the stairs, the average degree of forward bending was significantly lower for the \( 2 \)-wheel stair chair \( (p < 0.05) \) and there were only subtle differences between the remaining stair chairs (Fig. 7a).

On the landings there were more pronounced differences in the forward bending across the five stair chairs \( (p < 0.001) \). The participants showed the least forward flexion when using the \( 2 \)-wheel stair chair and the most forward flexion using the long-track stair chair (Fig. 7b). The long-track chair requires the operator to push down on the handle to shift the load to the rear wheels and off of the tracks, thereby allowing the chair to be maneuvered on a flat surface. This pushing down was accomplished by leaning the torso forwards. The flexion associated with rear-facing stair chair occurred as the participant grasped the lower set of handles to lift the back of the chair such that the occupant’s weight could be balanced on the front wheels during the turn on the landing.

3.6. Usability analysis

A camera mounted above the first landing was used to quantify the number of contacts made by the device and/or operator with the wall panels while maneuvering through the landing. For the 1.12 m and 1.32 m stair width analysis, the number of contacts with the wall for significantly varied \( (p < 0.001) \) across the 5 devices. Across the 12 subject, 48 stair descents were conducted with each evacuation chair for these two staircase widths under both levels of urgency. The rear-facing device had the highest contact rate \( (0.42 \, \text{contacts/descent}) \), followed by the long-track stair chair \( (0.29 \, \text{contacts/descent}) \). The standard, \( 2 \)-wheel, and narrow devices had 0, 0.08, and 0.13 contacts/descent, respectively. There was also a significant difference across the three devices used on the 0.91 m.

Table 1

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Effect</th>
<th>Erector Spinae</th>
<th>Latissimus dorsi</th>
<th>Deltoid</th>
<th>Bicep</th>
<th>Tricep</th>
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<tr>
<td>Mean EMG</td>
<td>Stair chair width</td>
<td>&lt;0.001</td>
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<td>&lt;0.001</td>
<td>0.038</td>
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<td></td>
<td>Urgency</td>
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<td>0.001</td>
<td>0.002</td>
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<td></td>
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<td>0.001</td>
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<td>Mean EMG</td>
<td>Stair chair * duration</td>
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<tr>
<td></td>
<td>Urgency</td>
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<td>0.005</td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stair chair * width</td>
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<td>&lt;0.001</td>
<td>0.001</td>
<td>0.003</td>
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</tr>
</tbody>
</table>
wide stairs \((p < 0.01)\). The 2-wheel device had a contact rate of 0.13 contacts/descent, versus the standard and narrow devices that respectively had 0.71 and 0.88 contacts/descent.

Following the stair descent tasks the participants were interviewed and asked to identify features or characteristics of each device that they liked and disliked. The results of these interviews are summarized in Table 3. In general, this group of experienced firefighters had more things they liked than disliked about the narrow, 2-wheel, and standard devices. The opposite was true for the long-track and rear-facing devices.

4. Discussion

The comparison of five track-type evacuation devices has highlighted several different design features across these devices and their biomechanical effects on the evacuator. Overall, the standard, narrow, and 2-wheel devices allowed for quicker evacuations and were perceived as easier to use. The muscle recruitment data on the stairs are clearly less than that observed with hand-carried evacuation devices (Lavender et al., 2013). Specifically, the average Erector Spinae muscle activation on the stairs with hand-carried devices was approximately 40% MVC (Lavender et al., 2013) as compared to 14% MVC reported in this study. On the landings, the muscle activation levels were of similar magnitude to those seen with the hand-carried devices, although the track type devices were operated by a single evacuator, whereas the hand-carried devices required two operators. More relevant to the current evaluation, the collected data delineates the effects of different design features across the track-type devices.
The number of wheels used to maneuver through the landing and the location of those wheels had a large impact on the shoulder and arm muscle activation levels. The devices that are rolled on two wheels and where the wheels are located in front of the occupant’s center of mass (rear-facing and 2-wheel) resulted in significantly higher deltoid and bicep activation levels. Readers that are less familiar with the devices should think of the load distribution with a standard wheel-barrow. The long-track device was also maneuvered through the landing on two wheels. The wheels on this device are located behind the occupant’s center of mass and therefore required the evacuator to push vertically downwards on the handle.

Table 2

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Effect</th>
<th>Erector spinae</th>
<th>Latissimus dorsi</th>
<th>Deltoid</th>
<th>Bicep</th>
<th>Tricep</th>
</tr>
</thead>
<tbody>
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<td>1.12 and 1.32 m wide stairs</td>
<td>Stair chair</td>
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<td>&lt;0.001</td>
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<tr>
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<td>Urgency</td>
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<tr>
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<tr>
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<tr>
<td></td>
<td>Stair chair * urgency</td>
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</tbody>
</table>

Fig. 5. The 90th percentile EMG response for the data collected when on the landing during the 1.12 and 1.32 m wide staircase conditions for the Erector Spinae (a), Latissimus Dorsi (b), Deltoid (c), Biceps (d) and Triceps (e). Bars connected by the same horizontal line are not statistically different as determined via post-hoc analyses. Shaded regions represent the range of values observed across three hand-carried devices evaluated using a similar evacuation task (Lavender et al., 2013).

Fig. 6. The 90th percentile deltoid muscle response sampled on the landing for the three stair chairs used with on the three staircase widths.
determined via post-hoc analyses.

On the landing, the long-track resulted in the most trunk flexion, in part because of the need for downward pressure on the handle as described above and the relatively low handle. This was followed by the rear-facing device, which required the evacuator to bend further and lift the lower set of handles when shifting from the tracks to the front two-wheels. This resulted in the highest erector spinae response on the landing, albeit was not statistically different from the other devices.

The length of device clearly affected the maneuverability and the wall contact data. The two longer devices (rear-facing, long-track) had the highest wall contact rates on the 1.12 and 1.32 m wide stairs and landing devices. With the long track, frequently the wall contact occurred between the front of the device and the wall in front of the first stair flight. Most of the wall contact for the rear-facing device was between the wall and side of the device or between the wall and the back of the evacuator as the device was prepared to descend the next flight of stairs. This contact between the wall and the evacuator was also the most frequent type of contact for the standard and narrow devices. In many cases, the contact was between the wall and the EMG transmitter or Lumbar Motion Monitor. While these would not be present during real evacuations, the firefighters would potentially be wearing turnout gear and breathing apparatus. It should also be noted that the length of the two longer devices precluded their use on the narrow staircase (0.91 m). This further emphasizes the need to consider this aspect of the device design when making purchase decisions.

On the other hand, the longer devices had longer tracks that could bridge 3 stair nosings. These provide a smoother ride for the occupant and reduce the need to push vertically downwards on the handle. This downward vertical push, as evidenced by the triceps response, keeps the front of the tracks from dipping below the imaginary line connecting the stair nosings and therefore smoothes the transition to the next step. Failure to provide the downward force on the handle with the standard, narrow, or 2-wheel devices results in a bumpy ride for the occupant.

All devices tested showed stair descent speeds that were consistent with the pedestrian evacuation speed data reported by Peacock et al. (2012) and Ma et al. (2012). At first look, this suggests that there would be minimal interference with a significant pedestrian flow in a mass evacuation scenario. However, unlike the work of Adams and Galea (2010), our study was conducted with no one other than the evacuator and the evacuee in the device on the landing. The landings are where the bottlenecks in the evacuation flow typically occur, especially as more individuals are merging into flow from different floors (Galea et al., 2008). Additional people on the stairs or on the landing, while perhaps providing a more realistic view of a mass evacuation scenario, would have increased the durations and not provided good indicators of potential egress velocities with the tested devices. In comparison with hand-carried devices, Lavender et al. (2013) reported stair descent speeds ranging between 0.36 m/s and 0.38 m/s for two hand-carried devices where the leader of the two-person team descends the stairs backwards. One hand-carried device...
tested by these same authors, where the leader of the two-person team could face forwards, descended at speeds comparable (0.68 m/s) to the faster track type devices evaluated in the current study. Comments in the parentheses were inserted by the investigators to clarify the participant comments. Positive and negative comments from the participants addressing the usability of each track-type stair descent device the participants used in the study. Comments in the Table 3

<table>
<thead>
<tr>
<th>Device</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| Narrow | • Works well in narrow space  
• Easy to move from track to wheel  
• 4 wheels (available when on landing) | • Narrow device  
• Rocks a lot with larger patient  
• Tended to tilt sideways  
• Slides sideways |
| 2-Wheel | • Liked tracks  
• Easy to pull back (easy to prepare for the stairs)  
• Brakes (has a brake system)  
• Smooth ride  
• Easy (to get) around corners | • No place to kick it back like on hand truck  
• Had to line up straight with the stairs otherwise (device) wanted to tip  
• Hand position limits balance |
| Standard | • Easier to operate  
• Solid base width  
• 4 wheels to pivot (on landing)  
• Easy to get on tracks (at top of the stairs)  
• Sturdy  
• Wider handle at top compared to the “narrow” stair chair  
• Easy to steer  
• Easy to use – (tracks) caught (gripped) stairs well  
• Smooth  
• Easy to turn on landing  
• Doesn’t take off on you | • More difficult to set up  
• Noisy – minor issue  
• Lap swivel belt hard to use |
| Long-track | • Liked brake  
• Tracks can stop device  
• More controlled speed  
• Strap easy to put on but a little cumbersome | • Most difficult to use  
• Rough (difficult) transition from stairs to landing  
• Requires more training because of complexity  
• Braking system is counter intuitive  
• Handle too low |
| Rear-facing | • Descent was smooth  
• Had control on stairs  
• Liked patient facing me — can observe patient  
• When tilt patient back, (their) legs don’t get in way so (i) can make a tighter turn  
• Treads easy to control | • Hard to maneuver because of length  
• Have to change hand position while in motion  
• Requires large radius for turning  
• Required a lot of lifting at turns and therefore more energy  
• Wheels tended to jump (during turn)  
• No second set of wheels to put device down (during turn)  
• Unstable, loose  
• Exceeded balance point — lost some control (when tipped up for turn)  
• Construction felt shoddy  
• Patient faces you — may be uncomfortable for patient  
• Patient has to be very upright (tipped back to make the turn) — could go head over heels if (FF) stumbles |

It should be noted that there were no overall stair width effects for either the task performance measures or the EMG results. In their study of four stairs widths (1.4 m, 1.2 m, 0.9 m, and 0.75 m) Abe et al. (2007) reported increased decent durations with an “evacuation chair” only at the 0.75 m stair width. These authors did not assess physical demands directly but noted more corrective maneuvering was required to complete the task with the narrower stair widths. Our data are consistent with Abe et al. in that the 0.91 m width accounted for slower landings, especially with the narrow chair.

There are several limitations to this analysis that should be acknowledged. First, these devices were evaluated with relatively short three-flight evacuations. This was done to manage participant fatigue levels given that each participant was being asked to perform 26 descents in addition to the 5 training descents. What has to be considered is the cumulative fatigue effect that would be encountered with longer evacuations from large high rise structures. Relatively small differences in muscle recruitment levels may still affect the fatigue rate and the ability for the evacuators to effectively control the device and maintain a pace consistent with the flow of others on the stairs. Moreover, localized fatigue in the muscles sampled alters the characteristics of the EMG signal (Basmajian and De Luca, 1985), therein confounding the interpretation of these signals. Second, female participants were not included in the sample. The research was open to female participants, however, none volunteered. There are very few female firefighters amongst the fire departments where recruiting took place. Third, the weight of the evacuee was limited to 73 kg.
Consistent with the CDC’s report on obesity (CDC, 2012), many of the firefighters indicated that many of the people they transport weigh considerably more. Pilot testing with a significantly heavier chair occupant (up to 136 kg) suggested that while the control of the track-type devices would be adequate, fatigue would be a significant factor and would limit the number of experimental conditions that could be tested. Fourth, as the evacuee was a rescue mannequin, we cannot provide any information as to occupant preferences and concerns with the tested devices. We have conducted a subsequent study with individuals that have mobility limitations to address this issue. Fifth, the participants in the current study were instructed to descend the stairs along the inside rail to maximize the space that would be available for making the turn on the landing. This could potentially be problematic if there was upward bound foot traffic (i.e., additional firefighters) at the same time as during the World Trade Center evacuation (Shields et al., 2009). Further investigation is needed to determine the degree to which these track-type evacuation devices would impede pedestrian flow during full scale building evacuations.

5. Conclusion

All of the track-type stair descent devices tested reduce the physical demands on the operators relative to hand-carried devices and can be operated at stair descent speeds consistent with published evacuation data. There are significant differences across the existing track-type stair descent devices with regards to evacuation times and the physical demands placed on the evacuators during evacuations involving stair descents. Based on these findings we would strongly recommend the use of track type devices that are shorter in overall length as these were more easily maneuvered through the landings. However, designers of these devices should consider lengthening their tracks so that three stair nosings can be bridged on staircases found outside the home. Track type devices that easily engage four wheels on the landing reduce the demands on the arms and shoulders that could be fatiguing if people are being evacuated from tall buildings.

References


RESNA Position Paper on the Use of Evacuation Chairs

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RESNA Position Paper on the Use of Evacuation Chairs

INTRODUCTION

The purpose of this document is to share information on options available regarding emergency stair travel devices used by individuals with disabilities during evacuations, as well as to provide evidence from the literature supporting the use of track-type evacuation chairs. It is not intended to replace professional judgment related to specific occupants and building environments.

BACKGROUND

Emergency evacuation by individuals with disabilities from buildings of all types, but especially from high-rises¹, has received consistent attention from the international life safety community. Regarding interest from the general public, attention has been focused on the issue following the attacks on the World Trade Center in 1993 and 2001 (Juillet, 1993; Shields et al, 2009).

Evacuation by all building occupants involves recognition of the situation and the need to evacuate, and horizontal and / or vertical movement along an evacuation route to the floor of discharge. Regarding vertical travel, travel along stairs is likely to be involved. Where elevators are present, life safety codes have prohibited their use, leaving stairways as the approved route. Although code changes are being considered for elevators having specific features and routing algorithms, their use will add to the routes available, not replace stairway use. Depending on the building, as well as the type and location of the incident, use of stairs for evacuation must be considered (NFPA, 2007).

An evacuation plan for occupants of a high-rise, or of a building of any height where the use of stairs is involved, may include horizontal travel to an area of rescue assistance, where life safety personnel can assist with travel along stairs, if necessary. The use of stairs by individuals unable to traverse stairs for emergency evacuation can be addressed through the use of an emergency stair travel device.


Emergency stair travel devices vary in design, but can be categorized as carry-type, track-type, and sled-type (Hedman, 2009). Devices in these three main design categories have distinctly different features, and are marketed for use in different environments.

¹ As defined by NFPA 101:2015, “a building where the floor of an occupiable story is greater than 23 m (75 ft) above the lowest level of fire department vehicle access.”
One type of emergency stair travel device, track-type evacuation chairs, is recognized as part of an effective emergency plan enabling individuals with disabilities to exit a building safely (NFPA, 2007; Steinfeld, 2006). Their use has been documented in evacuation drills, emergency events, and accessible building design (Bruyere, 2002; Davis, 2005; Meenan, 2007; Tsouderos, 2007; Product Review, 2009).

**STAKEHOLDERS**

All individuals who have an interest or specific role in safe evacuation from buildings are stakeholders regarding emergency stair travel device use. Building occupants with disabilities are certainly a part of this group. These individuals would include those with mobility impairment addressed via wheelchair use, as well as other impairments which may limit travel down stairs (e.g., cardiac, respiratory, sensory). These impairments may or may not be evident, and individuals themselves would decide whether or not to self-identify as part of an evacuation plan, when such exists, for a specific building.

Assistive Technology service providers are stakeholders, in that they would be asked by consumers about the devices, or be asked to make recommendations based on a consumer’s abilities and the building environment.

Consultants regarding emergency management, life safety, and security are also stakeholders. A sound knowledge base on the devices is needed, to make recommendations appropriate for specific environments and the mix of building occupants.

Building owners and managers, responsible for the equipping of a building for safety, are stakeholders. This group may be investigating emergency stair travel device use proactively, may be responding to interest expressed by building occupants, or may be responding to local ordinances which require their provision.

Employers are stakeholders, as they attempt to outfit their offices or facilities with equipment appropriate for their employees, or in response to a request for accommodation by a specific employee.

Municipalities are stakeholders, as they make decisions on the outfitting of public spaces such as city or villages halls, community centers, libraries, etc.

Fire and life safety services are important stakeholders, as they outfit their vehicles to assist individuals with evacuation or transport to medical services. For this group, performance is important but also the ability to store the device within limited space on the vehicles.

As educational systems (K-12, colleges, and universities) ensure that their buildings are accessible for academic and extramural activities, acquisition of emergency stair travel devices are considered.
Occupants and professionals associated with several types of large facilities are also stakeholders. These include hotels, conference centers, theme parks, and sports/entertainment venues (i.e., arenas and stadiums).

Personnel at facilities which address medical and rehabilitation needs, including hospitals and nursing homes, have unique factors which may affect their selection of emergency stair travel devices. These include the medical stability of the occupants, transport of any life support equipment, and whether or not the evacuees can be secured in a seated position.

Individuals with disabilities live in a variety of settings in the community, including assisted living centers, group homes, and single-family homes/apartments/condominiums. Outfitting of these living environments involves consideration of the occupants of the devices, and those identified to assist with evacuation procedures.

Clearly, the use of emergency stair travel devices is of high importance to individuals with disabilities and life safety personnel. The stakeholder list is evidence that the use of emergency stair travel devices is also of importance to building personnel, emergency management teams, family members, and co-workers. These groups will include experienced and novice users.

EQUIPMENT

Of the three design types noted, each has a presence in life safety and building environments.

Carry-type devices vary from fabric slings to metal chairs with carry handles. Costs vary accordingly, and all have the requirement of full support for the occupant by two to four operators. Transfers occur at the approximate height of wheelchair seat levels for most carry-type devices.

Track-type devices offer the possibility of single-operator use, with descent usually controlled via the friction present between a rubber belt and the track. One model offers additional control via a speed governor and brake. As such, the operator is not required to support the weight of the device and occupant, only the force to guide the occupant and device down the stairs. Transfers occur at the approximate height of wheelchair seat levels for most track-type devices.

Sled-type devices offer the lowest cost, but require the occupant to be either in a supine position, or in a seated position at floor level. This introduces the requirement of a transfer to the floor level. During operation and using attached straps, the lead operator must guide the occupant through turns at landings, and the following operator must ease the occupant and device down the stair sections. For most sled-type devices, the following operator provides all required resistance to the sled and occupant sliding down the stairs. Sled-type devices are often marketed to hospitals, where patients may not be stable in a seated position.
RECOMMENDATIONS

Based on research, product design features, needs of life safety professionals, and requirements of the environments themselves, several recommendations can be made with the goal of maximizing the achievement of safe evacuation during emergencies.

Recommendation 1
For building occupants who can be in a seated position, track-type evacuation chairs should be utilized.

Any device which is effective in assisting individuals to safety is of value, however research indicates that the track-type evacuation chairs offer distinct advantages.

Fredericks et al (2002a; 2002b) and Butt et al (2002) documented the advantage of track-type evacuation chairs over carry-type evacuation chairs for the operator, through significantly lower compression forces at the L5/S1 area of the spine, reducing the probability for low back disorders. The lower compression forces were again present in a later study by Fredericks et al (2006), where the influence of track-type frame design was investigated.

Adams and Galea (2011) studied the use of four different evacuation devices: a track-type chair, carry-type chair, stretcher, and drag mattress along an evacuation route in a hospital. Participants were able to achieve the highest speeds along a hallway with the track-type chair and carry-type chair (1.5 m / sec) and highest speeds along the stairs with the track-type chair (0.81 m / sec). The researchers noted that the track-type chair was able to be operated by one individual, whereas the carry-type chair required 3-4 individuals.

Researchers have studied the demands on firefighters operating a total of 14 carry-type, track-type, and sled-type devices (Lavender, 2011; Lavender, 2013; Mehta, 2015). A fire service training mannequin was loaded in each device as it was taken down 1-1/2 flights of stairs, including 2 landings. Several advantages of track-type evacuation chair use were identified. First, track-type chairs are able to be used by a single operator. This enables life safety personnel to be dispatched more quickly to all individuals who may require assistance in an emergency evacuation. Second, travel speeds along the stairs are within the range observed for the general population. While the track system provides friction to prevent free travel down the stairs, a pace matching that of other evacuees is possible. Third, travel through landings can be relatively efficient. Although travel through a landing is slower than along the stairs, if a track-type chair has an adequate wheeled base, it can be moved through the 180-degree turn efficiently. Fourth, the work required on the part of the operator, based on design, can be reasonable. The operator is not required to support the weight of the occupant at any time, and adjustable handles enable the device to be maneuvered safely.

For environments where occupants cannot achieve a seated position, sled-type devices are a reasonable option.
**Recommendation 2**
When selecting a track-type evacuation chair, preference should be given to devices which comply with the ANSI/RESNA ED-1 Standard.

Compliance with the ED-1 Standard ensures that the device has passed test requirements for minimum weight capacity, maneuverability, forward stability, and lateral stability. It is the only standard which exists for evacuation chairs.

The minimum rated weight capacity for an ED-1 compliant device is 159 kg (350 lb) to recognize the current data on body weight. Devices must be able to be maneuvered through a 180-degree turn on a middle landing, with landing length and width dimensions as stipulated by building codes (e.g., a 72”-wide x 36”-long middle landing for a 36”-wide stairway; NFPA 101-2015, 7.2.2.3.2.4). Stability is tested with a loaded device on an inclined surface, in both the forward and lateral directions (e.g., for downward travel device configuration, 40 degrees forward without losing contact with support surface). Presentations on the development of the ED-1 Standard have been provided at several key disability and life safety conferences, and have been well-received (Hedman, 2012; Hedman, 2009; Lavender et al, 2011).

**Recommendation 3**
When outfitting a building accessed by the public for goods and services for emergency stair travel devices, the goal of the allocation of at least one device at each floor of each stairway is recommended.

Several factors indicate that each floor along each stairway should be equipped with a stair descent device. First, the number of individuals with a disability affecting ambulation is significant, estimated at over 20 million individuals (6.9%) of the non-institutionalized population in the United States (Erickson et al, 2014). With an emphasis on living independently in the community, and access to goods, services, and employment under the Americans with Disabilities Act, the presence of individuals with disabilities is likely. Second, there may be many individuals who have a disability that is not evident, such as cardiac or respiratory limitations. Third, during an emergency there may be individuals who become injured, and may need an emergency stair travel device to be transported to safety.

**Recommendation 4**
Where there are known additional building occupants who will need an emergency stair travel device in an evacuation, the acquisition of one device for each should be considered.

The Americans with Disabilities Act has enabled many individuals with disabilities to achieve employment. As individuals with disabilities work in environments accessed by the public for goods and services, their known need for an emergency stair travel device should not reduce the number present for the public at-large. Acquisition of emergency stair travel devices for these employees, stored in a location which makes them readily available for use, will help maximize efficient evacuation for all building occupants.
Together, the recommendations are intended to improve life safety and benefit all stakeholders. Building occupants with disabilities will benefit through the availability of effective devices. Assistive Technology clinicians and consultants will benefit through the ability to more accurately recommend devices to meet the needs of building occupants. Fire and life safety services will be able to outfit their vehicles with effective equipment, and inform the community of best practices as they perform training and outreach. Building owners and managers (including those of municipal, private sector, and educational settings) will be able to provide effective equipment, in adequate numbers, and in proper locations for effective use.

ADDITIONAL SUGGESTED PRACTICES

When introducing equipment to outfit a building for evacuation, mobility devices (e.g., manual wheelchairs) should be obtained to enable occupants to use in order to travel from the stairway at the floor of discharge to the outside and away from the facility.

Some emergency stair travel devices are designed such that they can be operated on horizontal pathways of long distances, other are not. Also, some are designed to support an occupant on a 4-wheeled base, others are not. In all cases, once stair travel to the floor of discharge by one occupant has been achieved, it will be beneficial to the safe evacuation of all building occupants with disabilities if the device were made available for others to use (via the device being brought back upstairs by life safety personnel).

Provision of a mobility device will require a transfer from the emergency stair travel device to the mobility device. The mobility devices should be positioned near the stairway. To achieve this, some building managers have positioned manual wheelchairs on wall brackets immediately outside the stairway.

When considering acquisition of a stair descent device for use, all members of the emergency planning team, and the building occupants who would use the device during an evacuation, should try out the device. Merely reading through advertisements and training materials is insufficient for informed purchases.

After acquisition, personnel who will be occupants or operators of the device should review all training materials provided by the manufacturer, and try out the device. A thorough understanding of the device is needed for safe, effective use. By learning about all aspects of the device, the occupants and operators will be knowledgeable about the requirements for deployment, safety features, and operation.

Training opportunities and practice use should be repeated on a regular basis. Training and practice use will help maintain the knowledge levels, and provide a means for new occupants and operators to become familiar with usage.
SUMMARY

It is RESNA’s position that ANSI / RESNA ED-1 – compliant track-type evacuation chairs offer design features beneficial to occupants and operators which include wheelchair-level transfer height, efficient use by a single operator, stability, maneuverability, and travel speeds along stairs matching those of other building occupants. These design features help promote safe, efficient evacuation during emergencies.

REFERENCES


Davis, G. School’s plan for escape reviewed; Panel adds word to policy, suggests devices to assist disabled in an evacuation. The Sun, Baltimore, MD, January 17, 2005, 1.B.


**RESNA**, the Rehabilitation Engineering and Assistive Technology Society of North America, is the premier professional organization dedicated to promoting the health and well-being of people with disabilities through increasing access to technology solutions. RESNA advances the field by offering certification, continuing education, and professional development; developing assistive technology standards; promoting research and public policy; and sponsoring forums for the exchange of information and ideas to meet the needs of our multidisciplinary constituency. Find out more at [www.resna.org](http://www.resna.org).
11.2.2.3.2
Spiral stairs shall be permitted, provided that all of the following criteria are met:

(1) Riser heights shall not exceed 7 in. (180 mm).

(2) The stairway shall have a tread depth of not less than 11 in. (280 mm) for a portion of the stairway width sufficient to provide egress capacity for the occupant load served in accordance with 11.3.3.1.

(3) At the outer side of the stairway, an additional 10 1/2 in. (265 mm) of width shall be provided clear to the other handrail, and this width shall not be included as part of the required egress capacity.

(4) Handrails complying with 11.2.2.4 shall be provided on both sides of the spiral stairway.

(5) The inner handrail shall be located within 24 in. (610 mm), measured horizontally, of the point where a tread depth of not less than 11 in. (280 mm) is provided.

(6) The turn of the stairway shall be such that descending users have the outer handrail at their right side.

Statement of Problem and Substantiation for Public Input

This appears to be arbitrary.

Submitter Information Verification

Submitter Full Name: Jim Muir
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Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 17:44:10 EDT 2015

Committee Statement

Resolution: The provision is not arbitrary. Users typically walk on the right where wider tread is provided.
Public Input No. 135-NFPA 5000-2015 [Section No. 11.3.4.1.1]

11.3.4.1.1 -

The width of exit access serving not more than six people and having a length not exceeding 50 ft (15 m) shall meet both of the following criteria:

1. The width shall be not less than 18 in. (455 mm) at and below a height of 38 in. (965 mm), and not less than 28 in. (710 mm) above a height of 38 in. (965 mm).

2. The width of not less than 36 in. (915 mm) for exit access shall be capable of being provided without moving permanent walls.

Statement of Problem and Substantiation for Public Input

This is in conflict with the federal accessibility guidelines.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: Jim Muir
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Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
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Submittal Date: Sat Jul 04 17:46:24 EDT 2015

Committee Statement

Resolution: The provision for not requiring the moving of permanent walls is intended to accommodate accessibility. Not all areas are required to be made accessible.
11.4.2   Spaces About Electrical Equipment.

11.4.2.1   600 Volts, Nominal, or Less.

11.4.2.1.1   Number of Means of Egress. The minimum number of means of egress for
working space about electrical equipment shall be in accordance with NFPA 70, National
Electrical Code, Article 110.26(C).

11.4.2.1.2   Door Unlatching and Direction of Door Swing. The method of door unlatching
and direction of door swing for working space about electrical equipment shall be in
accordance with NFPA 70, National Electrical Code, Section 110.26(C)(3).

11.4.2.2   Over 600 Volts, Nominal.

11.4.2.2.1   Number of Means of Egress. The minimum number of means of egress for
working space about electrical equipment shall be in accordance with NFPA 70, National
Electrical Code, Article 110.33(A).

11.4.2.2.2   Door Unlatching and Direction of Door Swing. The method of door unlatching
and direction of door swing for working space about electrical equipment shall be in
accordance with NFPA 70, National Electrical Code, Section 110.33(A)(3).

Statement of Problem and Substantiation for Public Input

Code users should be forewarned that the NEC includes requirements on the means of door
unlatching and direction of door swing for spaces about electrical equipment. Design and installation
to the only the requirements in NFPA 5000 will not result in a complying situation. It is better to know
about the requirement and meet it at the time of design/construction than to be denied a Certificate of
Occupancy.

Related Public Inputs for This Document

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Submitter Information Verification

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<th>Submitter Full Name: WILLIAM KOFFEL</th>
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<tr>
<td>Organization: KOFFEL ASSOCIATES INC</td>
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Resolution: FR-6005-NFPA 5000-2015
Statement: Code users should be forewarned that the NEC includes requirements on the means of door unlatching and direction of door swing for spaces about electrical equipment. Design and installation to the only the requirements in NFPA 5000 will not result in a complying situation. It is better to know about the requirement and meet it at the time of design/construction than to be denied a Certificate of Occupancy.
Chapter 12  Accessibility

12.1  Application.  2010 ADA STANDARDS (DOJ)

This chapter contains all of the additional text for requirements added by the U.S. Department of Justice to the 2004 ADA/ABA-AG published by the U.S. Access Board in creating and adopting the 2010 ADA Standards published by the U.S. Department of Justice. Where technical requirements are covered in ICC/ANSI A117.1, they have been referenced. Requirements of the HUD Fair Housing Act Design Manual have been re-written in code language and incorporated in appropriate sections. [2010 ADA STANDARDS (DOJ): 201]

The number in brackets at the end of each paragraph refers to the paragraph number of the source document.

12.1.1  * -  Scope.

All areas of newly designed and newly constructed buildings and facilities and altered portions of existing buildings and facilities shall comply with these requirements. [2010 ADA STANDARDS (DOJ): 201.1]

12.1.2  Application Based on Building or Facility Use.

Where a site, building, facility, room, or space contains more than one use, each portion shall comply with the applicable requirements for that use. [2010 ADA STANDARDS (DOJ): 201.2]

12.1.3  * -  Temporary and Permanent Structures.

These requirements shall apply to temporary and permanent buildings and facilities. [2010 ADA STANDARDS (DOJ): 201.3]

12.2.1  * -  General.

Additions and alterations to existing buildings or facilities shall comply with Section 12.2. [2010 ADA STANDARDS (DOJ): 202]


12.2.1  * -  General.

Additions and alterations to existing buildings or facilities shall comply with Section 12.2. [2010 ADA STANDARDS (DOJ): 202.1]

12.2.2  * -  Additions.

Each addition to an existing building or facility shall comply with the requirements for new construction. Each addition that affects or could affect the usability of or access to an area containing a primary function shall comply with. [2010 ADA STANDARDS (DOJ): 202.2]

12.2.3  * -  Alterations.
Where existing elements or spaces are altered, each altered element or space shall comply with the applicable requirements of this chapter. [2010 ADA STANDARDS (DOJ): 202.3] Exception No. 1: Unless required by 12.2.4, where elements or spaces are altered and the circulation path to the altered element or space is not altered, an accessible route shall not be required. [2010 ADA STANDARDS (DOJ): 202.3, Exception 1]

Exception No. 2: In alterations, where compliance with applicable requirements is technically infeasible, the alteration shall comply with the requirements to the maximum extent feasible. [2010 ADA STANDARDS (DOJ): 202.3, Exception 2]

Exception No. 3: Residential dwelling units not required to be accessible in compliance with a standard issued pursuant to the Americans with Disabilities Act or Section 504 of the Rehabilitation Act of 1973, as amended, shall not be required to comply with 12.2.3. [2010 ADA STANDARDS (DOJ): 202.3, Exception 3]

12.2.3.1 – Prohibited Reduction in Access.

An alteration that decreases or has the effect of decreasing the accessibility of a building or facility below the requirements for new construction at the time of the alteration shall be prohibited. [2010 ADA STANDARDS (DOJ): 202.3.1]

12.2.3.2 – Extent of Application.

An alteration of an existing element, space, or area of a building or facility shall not impose a requirement for accessibility greater than required for new construction. [2010 ADA STANDARDS (DOJ): 202.3.2]

12.2.4 – Alterations Affecting Primary Function Areas.

In addition to the requirements of 12.2.3, an alteration that affects or could affect the usability of or access to an area containing a primary function shall be made so as to ensure that, to the maximum extent feasible, the path of travel to the altered area, including the rest rooms, telephones, and drinking fountains serving the altered area, are readily accessible to and usable by individuals with disabilities, unless such alterations are disproportionate to the overall alterations in terms of cost and scope as determined under criteria established by the Attorney General. In existing transportation facilities, an area of primary function shall be as defined under regulations published by the Secretary of the Department of Transportation or the Attorney General. [2010 ADA STANDARDS (DOJ): 202.4]

Exception: Residential dwelling units shall not be required to comply with 12.2.4. [2010 ADA STANDARDS (DOJ): 202.4, Exception]

12.2.5 – Alterations to Qualified Historic Buildings and Facilities.

Alterations to a qualified historic building or facility shall comply with 12.2.3 and 12.2.4. [2010 ADA STANDARDS (DOJ): 202.5]

Exception: Where the State Historic Preservation Officer or Advisory Council on Historic Preservation determines that compliance with the requirements for accessible routes, entrances, or toilet facilities would threaten or destroy the historic significance of the building or facility, the exceptions for alterations to qualified historic buildings or facilities for that element shall be permitted to apply. [2010 ADA STANDARDS (DOJ): 202.5, Exception]

12.3 – General Exceptions.

[2010 ADA STANDARDS (DOJ): 203]

12.3.1 – General.

Sites, buildings, facilities, and elements are exempt from these requirements to the extent specified by Section 12.3. [2010 ADA STANDARDS (DOJ): 203.1]
12.3.2 Construction Sites.

Structures and sites directly associated with the actual processes of construction, including but not limited to, scaffolding, bridging, materials hoists, materials storage, and construction trailers shall not be required to comply with these requirements or to be on an accessible route. Portable toilet units provided for use exclusively by construction personnel on a construction site shall not be required to comply with Section 12.13 or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.2]

12.3.3 Raised Areas.

Areas raised primarily for purposes of security, life safety, or fire safety, including but not limited to, observation or lookout galleries, prison guard towers, fire towers, or life guard stands shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.3]

12.3.4 Limited Access Spaces.

Spaces accessed only by ladders, catwalks, crawl spaces, or very narrow passageways shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.4]

12.3.5 Machinery Spaces.

Spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment shall not be required to comply with these requirements or to be on an accessible route. Machinery spaces include, but are not limited to, elevator pits or elevator penthouses; mechanical, electrical or communications equipment rooms; piping or equipment catwalks; water or sewage treatment pump rooms and stations; electric substations and transformer vaults; and highway and tunnel utility facilities. [2010 ADA STANDARDS (DOJ): 203.5]

12.3.6 Single Occupant Structures.

Single occupant structures accessed only by passageways below grade or elevated above standard curb height, including but not limited to, toll booths that are accessed only by underground tunnels, shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.6]

12.3.7 Detention and Correctional Facilities.

In detention and correctional facilities, common use areas that are used only by inmates or detainees and security personnel and that do not serve holding cells or housing cells required to comply with Section 12.32, shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.7]

12.3.8 Residential Facilities.

In residential facilities, common use areas that do not serve residential dwelling units required to provide mobility features complying with 12.45.5.2 through 12.45.5.5 shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.8]

12.3.9 Employee Work Areas.

Spaces and elements within employee work areas shall only be required to comply with Section 12.7 and 12.15.3 and shall be designed and constructed so that individuals with disabilities can approach, enter, and exit the employee work area. Employee work areas, or portions of employee work areas, that are less than 300 ft² (28 m²) and elevated 7 in. (180 mm) or more above the finish floor or ground where the elevation is essential to the function of the space shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.9]
12.3.10 - Raised Refereeing, Judging, and Scoring Areas.
Raised structures used solely for refereeing, judging, or scoring a sport shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.10]

12.3.11 - Water Slides.
Water slides shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.11]

12.3.12 - Animal Containment Areas.
Animal containment areas that are not for public use shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.12]

12.3.13 - Raised Boxing or Wrestling Rings.
Raised boxing or wrestling rings shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.13]

12.3.14 - Raised Diving Boards and Diving Platforms.
Raised diving boards and diving platforms shall not be required to comply with these requirements or to be on an accessible route. [2010 ADA STANDARDS (DOJ): 203.14]

12.4 - Protruding Objects.

Exception No. 1: Within areas of sport activity, protruding objects on circulation paths shall not be required to comply with ICC/ANSI A117.1, Section 307. [2010 ADA STANDARDS (DOJ): 204.1, Exception 1]

Exception No. 2: Within play areas, protruding objects on circulation paths shall not be required to comply with ICC/ANSI A117.1, Section 307 provided that ground level accessible routes provide vertical clearance in compliance with 12.45.14.2. [2010 ADA STANDARDS (DOJ): 204.1, Exception 2]
12.5 Operable Parts.

[2010 ADA STANDARDS (DOJ): 205] Operable parts on accessible elements, accessible routes, and in accessible rooms and spaces shall comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1]

Exception No. 1: Operable parts that are intended for use only by service or maintenance personnel shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 1]

Exception No. 2: Electrical or communication receptacles serving a dedicated use shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 2]

Exception No. 3: Where two or more outlets are provided in a kitchen above a length of counter top that is uninterrupted by a sink or appliance, one outlet shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 3]

Exception No. 4: Floor electrical receptacles shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 4]

Exception No. 5: HVAC diffusers shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 5]

Exception No. 6: Except for light switches, where redundant controls are provided for a single element, one control in each space shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 6]

Exception No. 7: Cleats and other boat securement devices shall not be required to comply with ICC/ANSI A117.1, Section 309.3. [2010 ADA STANDARDS (DOJ): 205.1, Exception 7]

Exception No. 8: Exercise machines and exercise equipment shall not be required to comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 205.1, Exception 8]

12.6 Accessible Routes.

[2010 ADA STANDARDS (DOJ): 206]

12.6.1 General.

Accessible routes shall be provided in accordance with Section 12.6 and shall comply with ICC/ANSI A117.1, Chapter 4. [2010 ADA STANDARDS (DOJ): 206.1]

12.6.2 Where Required.

Accessible routes shall be provided where required by 12.6.2. [2010 ADA STANDARDS (DOJ): 206.2]

12.6.2.1 Site Arrival Points.

At least one accessible route shall be provided within the site from accessible parking spaces and accessible passenger loading zones; public streets and sidewalks; and public transportation stops to the accessible building or facility entrance they serve. [2010 ADA STANDARDS (DOJ): 206.2.1]

Exception No. 1: Where exceptions for alterations to qualified historic buildings or facilities are permitted by 12.2.5, no more than one accessible route from a site arrival point to an accessible entrance shall be required. [2010 ADA STANDARDS (DOJ): 206.2.1, Exception 1]

Exception No. 2: In other than lodging or rooming house and apartment building occupancies, an accessible route shall not be required between site arrival points and the building or facility entrance if the only means of access between them is a vehicular way not providing pedestrian access. [2010 ADA STANDARDS (DOJ): 206.2.1, Exception 2]
12.6.2.2 -- Within a Site.

At least one accessible route shall connect accessible buildings, accessible facilities, accessible elements, and accessible spaces that are on the same site. [2010 ADA STANDARDS (DOJ): 206.2.2]

Exception: In other than lodging or rooming house and apartment building occupancies, an accessible route shall not be required between accessible buildings, accessible facilities, accessible elements, and accessible spaces if the only means of access between them is a vehicular way not providing pedestrian access. [2010 ADA STANDARDS (DOJ): 206.2.2, Exception]

12.6.2.3 -- Multi-Story Buildings and Facilities.

12.6.2.3.1 General.

At least one accessible route shall connect each story and mezzanine in multi-story buildings and facilities. [2010 ADA STANDARDS (DOJ): 206.2.3]

Exception No. 1: In private buildings or facilities that are less than three stories or that have less than 3000 ft² (279 m²) per story, an accessible route shall not be required to connect stories provided that the building or facility is not a shopping center, a shopping mall, the professional office of a health care provider, a terminal, depot, or other station used for specified public transportation, an airport passenger terminal, or another type of facility as determined by the Attorney General. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 1]

Exception No. 2: Where a two story public building or facility has one story with an occupant load of five or fewer persons that does not contain public use space, that story shall not be required to be connected to the story above or below. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 2]

Exception No. 3: In detention and correctional facilities, an accessible route shall not be required to connect stories where cells with mobility features required to comply with 12.45.4.2, all common use areas serving cells with mobility features required to comply with 12.45.4.2, and all public use areas are on an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 3]

Exception No. 4: In residential facilities, an accessible route shall not be required to connect stories where residential dwelling units with mobility features required to comply with 12.45.5.3 through 12.45.5.6.6.2, all common use areas serving residential dwelling units with mobility features required to comply with 12.45.5.3 through 12.45.5.6.6.2, and public use areas serving residential dwelling units are on an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 4]

Exception No. 5: Within multi-story transient lodging guest rooms with mobility features required to comply with 12.45.3.2, an accessible route shall not be required to connect stories provided that spaces complying with 12.45.3.2 are on an accessible route and sleeping accommodations for two persons minimum are provided on a story served by an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 5]

Exception No. 6: In air traffic control towers, an accessible route shall not be required to serve the cab and the floor immediately below the cab. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 6]

Exception No. 7: Where exceptions for alterations to qualified historic buildings or facilities are permitted by 12.2.5, an accessible route shall not be required to stories located above or below the accessible story. [2010 ADA STANDARDS (DOJ): 206.2.3, Exception 7]
12.6.2.3.2 Stairs and Escalators in Existing Buildings.

In alterations and additions where an escalator or stair is provided where none existed previously and major structural modifications are necessary for the installation, an accessible route shall be provided between the levels served by the escalator or stair unless exempted by 12.6.2.3 Exception No. 1 through Exception No. 7. [2010 ADA STANDARDS (DOJ): 206.2.3.1]

12.6.2.4 Spaces and Elements.

At least one accessible route shall connect accessible building or facility entrances with all accessible spaces and elements within the building or facility which are otherwise connected by a circulation path unless exempted by 12.6.2.3 Exception No. 1 through Exception No. 7. [2010 ADA STANDARDS (DOJ): 206.2.4]

Exception No. 1: Raised courtroom stations, including judges' benches, clerks' stations, bailiffs' stations, deputy clerks' stations, and court reporters' stations shall not be required to provide vertical access provided that the required clear floor space, maneuvering space, and if appropriate, electrical service are installed at the time of initial construction to allow future installation of a means of vertical access complying with ICC/ANSI A117.1, Sections 405, 407, 408, or 410 without requiring substantial reconstruction of the space. [2010 ADA STANDARDS (DOJ): 206.2.4, Exception 1]

Exception No. 2: In assembly areas with fixed seating required to comply with Section 12.21, an accessible route shall not be required to serve fixed seating where wheelchair spaces required to be on an accessible route are not provided. [2010 ADA STANDARDS (DOJ): 206.2.4, Exception 2]

Exception No. 3: Accessible routes shall not be required to connect mezzanines where buildings or facilities have no more than one story. In addition, accessible routes shall not be required to connect stories or mezzanines where multi-story buildings or facilities are exempted by 12.6.2.3 Exception No. 1 through Exception No. 7. [2010 ADA STANDARDS (DOJ): 206.2.4, Exception 3]

12.6.2.5 Restaurants and Cafeterias.

In restaurants and cafeterias, an accessible route shall be provided to all dining areas, including raised or sunken dining areas, and outdoor dining areas. [2010 ADA STANDARDS (DOJ): 206.2.5]

Exception No. 1: In buildings or facilities not required to provide an accessible route between stories, an accessible route shall not be required to a mezzanine dining area where the mezzanine contains less than 25 percent of the total combined area for seating and dining and where the same decor and services are provided in the accessible area. [2010 ADA STANDARDS (DOJ): 206.2.5, Exception 1]

Exception No. 2: In alterations, an accessible route shall not be required to existing raised or sunken dining areas, or to all parts of existing outdoor dining areas where the same services and decor are provided in an accessible space usable by the public and not restricted to use by people with disabilities. [2010 ADA STANDARDS (DOJ): 206.2.5, Exception 2]

Exception No. 3: In sports facilities, tiered dining areas providing seating required to comply with Section 12.21 shall be required to have accessible routes serving at least 25 percent of the dining area provided that accessible routes serve seating complying with Section 12.21 and each tier is provided with the same services. [2010 ADA STANDARDS (DOJ): 206.2.5, Exception 3]
12.6.2.6 Performance Areas.
Where a circulation path directly connects a performance area to an assembly seating area, an accessible route shall directly connect the assembly seating area with the performance area. An accessible route shall be provided from performance areas to ancillary areas or facilities used by performers unless exempted by 12.6.2.3, Exception No. 1 through Exception No. 7. [2010 ADA STANDARDS (DOJ): 206.2.6]

12.6.2.7 Press Boxes.
Press boxes in assembly areas shall be on an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.7]

Exception No. 1: An accessible route shall not be required to press boxes in bleachers that have points of entry at only one level provided that the aggregate area of all press boxes is 500 ft² (46 m²) maximum. [2010 ADA STANDARDS (DOJ): 206.2.7, Exception 1]

Exception No. 2: An accessible route shall not be required to free-standing press boxes that are elevated above grade 12 ft (3660 mm) minimum provided that the aggregate area of all press boxes is 500 ft² (46 m²) maximum. [2010 ADA STANDARDS (DOJ): 206.2.7, Exception 2]

12.6.2.8 Employee Work Areas.
Common use circulation paths within employee work areas shall comply with ICC/ANSI A117.1, Section 402. [2010 ADA STANDARDS (DOJ): 206.2.8]

Exception No. 1: Common use circulation paths located within employee work areas that are less than 1000 ft² (93 m²) and defined by permanently installed partitions, counters, casework, or furnishings shall not be required to comply with ICC/ANSI A117.1, Section 402. [2010 ADA STANDARDS (DOJ): 206.2.8, Exception 1]

Exception No. 2: Common use circulation paths located within employee work areas that are an integral component of work area equipment shall not be required to comply with ICC/ANSI A117.1, Section 402. [2010 ADA STANDARDS (DOJ): 206.2.8, Exception 2]

Exception No. 3: Common use circulation paths located within exterior employee work areas that are fully exposed to the weather shall not be required to comply with ICC/ANSI A117.1, Section 402. [2010 ADA STANDARDS (DOJ): 206.2.8, Exception 3]

12.6.2.9 Amusement Rides.
Amusement rides required to comply with Section 12.34 shall provide accessible routes in accordance with 12.6.2.9. Accessible routes serving amusement rides shall comply with ICC/ANSI A117.1, Chapter 4. [2010 ADA STANDARDS (DOJ): 206.2.9]

12.6.2.9.1 Load and Unload Areas.
Load and unload areas shall be on an accessible route. Where load and unload areas have more than one loading or unloading position, at least one loading and unloading position shall be on an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.9.1]

12.6.2.10 Recreational Boating Facilities.
Boat slips required to comply with 12.35.2 and boarding piers at boat launch ramps required to comply with 12.35.3 shall be on an accessible route. Accessible routes serving recreational boating facilities shall comply with ICC/ANSI A117.1, Chapter 4. [2010 ADA STANDARDS (DOJ): 206.2.10]

12.6.2.11 Bowling Lanes.
Where bowling lanes are provided, at least 5 percent, but no fewer than one of each type of bowling lane, shall be on an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.11]
12.6.2.12 - Court Sports.

In court sports, at least one accessible route shall directly connect both sides of the court. [2010 ADA STANDARDS (DOJ): 206.2.12]

12.6.2.13 - Exercise Machines and Equipment.

Exercise machines and equipment required to comply with 1104 of ICC/A117.1. [2010 ADA STANDARDS (DOJ): 206.2.13]

12.6.2.14 - Fishing Piers and Platforms.

Fishing piers and platforms shall be on an accessible route. Accessible routes serving fishing piers and platforms shall comply with 1105 of ICC/ANSI A117.1. [2010 ADA STANDARDS (DOJ): 206.2.14]

12.6.2.15 - Golf Facilities.

At least one accessible route shall connect accessible elements and spaces within the boundary of the golf course. In addition, accessible routes serving golf car rental areas; bag drop areas; course weather shelters complying with 12.38.1.3; course toilet rooms; and practice putting greens, practice teeing grounds, and teeing stations at driving ranges complying with 42.38.2 shall comply with 1106 of ICC/ANSI A117.1. [2010 ADA STANDARDS (DOJ): 206.2.15]

12.6.2.16 - Miniature Golf Facilities.

Holes required to comply with 12.39.2, including the start of play, shall be on an accessible route. Accessible routes serving miniature golf facilities shall comply with 1107 of ICC/ANSI A117.1. [2010 ADA STANDARDS (DOJ): 206.2.16]

12.6.2.17 - Play Areas.

Play areas shall provide accessible routes in accordance with 12.40.2.1. Accessible routes serving play areas shall comply with 1108 of ICC/ANSI A117.1. [2010 ADA STANDARDS (DOJ): 206.2.17]

12.6.2.17.1 - Ground Level and Elevated Play Components.

At least one accessible route shall be provided within the play area. The accessible route shall connect ground level play components required to comply with 12.40.2.1 and elevated play components required to comply with 12.40.2.2, including entry and exit points of the play components. [2010 ADA STANDARDS (DOJ): 206.2.17.2]

12.6.2.17.2 - Soft Contained Play Structures.

Where three or fewer entry points are provided for soft contained play structures, at least one entry point shall be on an accessible route. Where four or more entry points are provided for soft contained play structures, at least two entry points shall be on an accessible route. [2010 ADA STANDARDS (DOJ): 206.2.17.2]

12.6.3 - Location.

Accessible routes shall coincide with or be located in the same area as general circulation paths. Where circulation paths are interior, required accessible routes shall also be interior. [2010 ADA STANDARDS (DOJ): 206.3]

12.6.4 - Entrance.
Entrances shall be provided in accordance with 12.6.4. Entrance doors, doorways, and gates shall comply with ICC/ANSI A117.1, Section 404 and shall be on an accessible route complying with ICC/ANSI A117.1, Section 402. [2010 ADA STANDARDS (DOJ): 206.4] Exception No. 1: Where an alteration includes alterations to an entrance, and the building or facility has another entrance complying with ICC/ANSI A117.1, Section 404 that is on an accessible route, the altered entrance shall not be required to comply with 12.6.4. unless required by 12.2.4. [2010 ADA STANDARDS (DOJ): 206.4, Exception 1]

Exception No. 2: Where exceptions for alterations to qualified historic buildings or facilities are permitted by 12.2.5, no more than one public entrance shall be required to comply with 12.6.4. Where no public entrance can comply with 12.6.4. under criteria established in 12.2.5, Exception, then either an unlocked entrance not used by the public shall comply with 12.6.4. or a locked entrance complying with 12.6.4. with a notification system or remote monitoring shall be provided. [2010 ADA STANDARDS (DOJ): 206.4, Exception 2]

12.6.4.1 - Public Entrances.

In addition to entrances required by 12.6.4.2. through 12.6.4.9., at least 60 percent of all public entrances shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.1]

12.6.4.2 - Parking Structure Entrances.

Where direct access is provided for pedestrians from a parking structure to a building or facility entrance, each direct access to the building or facility entrance shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.2]

12.6.4.3 - Entrances from Tunnels or Elevated Walkways.

Where direct access is provided for pedestrians from a pedestrian tunnel or elevated walkway to a building or facility, at least one direct entrance to the building or facility from each tunnel or walkway shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.3]

12.6.4.4 - Transportation Facilities.

In addition to the requirements of 12.6.4.2. through 12.6.4.9., transportation facilities shall provide entrances in accordance with 12.6.4.4. [2010 ADA STANDARDS (DOJ): 206.4.4]

12.6.4.4.1 - Location.

In transportation facilities, where different entrances serve different transportation fixed routes or groups of fixed routes, at least one public entrance shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.4.1]

Exception: Entrances to key stations and existing intercity rail stations retrofitted in accordance with 49 CFR 37.49 or 49 CFR 37.51 shall not be required to comply with 12.6.4.4.1. [2010 ADA STANDARDS (DOJ): 206.4.4.1, Exception]
12.6.4.4.2 – Direct Connections.

Direct connections to other facilities shall provide an accessible route complying with ICC/ANSI A117.1, Section 404 from the point of connection to boarding platforms and all transportation system elements required to be accessible. Any elements provided to facilitate future direct connections shall be on an accessible route connecting boarding platforms and all transportation system elements required to be accessible. [2010 ADA STANDARDS (DOJ): 206.4.4.2]

Exception: In key stations and existing intercity rail stations, existing direct connections shall not be required to comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.4.2, Exception]

12.6.4.4.3 – Key Stations and Intercity Rail Stations.

Key stations and existing intercity rail stations required by Subpart C of 49 CFR Part 37 to be altered, shall have at least one entrance complying with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.4.3]

12.6.4.5 – Tenant Spaces.

At least one accessible entrance to each tenancy in a facility shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.5]

Exception: Self-service storage facilities not required to comply with 12.25.4 shall not be required to be on an accessible route. [2010 ADA STANDARDS (DOJ): 206.4.5, Exception]

12.6.4.6 – Residential Dwelling Unit Primary Entrance.

In residential dwelling units, at least one primary entrance shall comply with ICC/ANSI A117.1, Section 404. The primary entrance to a residential dwelling unit shall not be to a bedroom. [2010 ADA STANDARDS (DOJ): 206.4.6]

12.6.4.7 – Restricted Entrances.

Where restricted entrances are provided to a building or facility, at least one restricted entrance to the building or facility shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.7]

12.6.4.8 – Service Entrances.

If a service entrance is the only entrance to a building or to a tenancy in a facility, that entrance shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.8]

12.6.4.9 – Entrances for Inmates or Detainees.

Where entrances used only by inmates or detainees and security personnel are provided at judicial facilities, detention facilities, or correctional facilities, at least one such entrance shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.4.9]

12.6.5 – Doors, Doorways, and Gates.

Doors, doorways, and gates providing user passage shall be provided in accordance with 426.5. [2010 ADA STANDARDS (DOJ): 206.5]

12.6.5.1 – Entrances.

Each entrance to a building or facility required to comply with 12.6.4 shall have at least one door, doorway, or gate complying with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.5.1]

12.6.5.2 – Rooms and Spaces.

Within a building or facility, at least one door, doorway, or gate serving each room or space complying with these requirements shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.5.2]
12.6.5.3 - Transient Lodging Facilities.

In transient lodging facilities, entrances, doors, and doorways providing user passage into and within guest rooms that are not required to provide mobility features complying with 12.45.3.2 shall comply with ICC/ANSI A117.1, Section 404.2.3. [2010 ADA STANDARDS (DOJ): 206.5.3]

Exception: Shower and sauna doors in guest rooms that are not required to provide mobility features complying with 12.45.3.2 shall not be required to comply with ICC/ANSI A117.1, Section 404.2.3. [2010 ADA STANDARDS (DOJ): 206.5.3, Exception]

12.6.5.4 - Residential Dwelling Units.

In residential dwelling units required to provide mobility features complying with 12.45.5.2 through 12.45.5.5, all doors and doorways providing user passage shall comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 206.5.4]

12.6.6 - Elevators.

Exception No. 1: In a building or facility permitted to use the exceptions to 12.6.2.3 or permitted by 12.6.7 to use a platform lift, elevators complying with ICC/ANSI A117.1, Section 408 shall be permitted. [2010 ADA STANDARDS (DOJ): 206.6, Exception 1]

Exception No. 2: Elevators complying with ICC/ANSI A117.1, Section 408 or Section 409 shall be permitted in multi-story residential dwelling units. [2010 ADA STANDARDS (DOJ): 206.1, Exception 2]

12.6.6.1 - New Elevators.

Elevators provided for passengers shall comply with ICC/ANSI A117.1, Section 407. Where multiple elevators are provided, each elevator shall comply with ICC/ANSI A117.1, Section 407. [2010 ADA STANDARDS (DOJ): 206.6]

12.6.6.2 - Existing Elevators.

Where elements of existing elevators are altered, the same element shall also be altered in all elevators that are programmed to respond to the same hall call control as the altered elevator and shall comply with the requirements of ICC/ANSI A117.1, Section 407 for the altered element. [2010 ADA STANDARDS (DOJ): 206.6.1]

12.6.7 - Platform Lifts.

Platform lifts shall comply with ICC/ANSI A117.1, Section 410. Platform lifts shall be permitted as a component of an accessible route in new construction in accordance with 12.6.7. Platform lifts shall be permitted as a component of an accessible route in an existing building or facility. [2010 ADA STANDARDS (DOJ): 206.7]

12.6.7.1 - Performance Areas and Speakers' Platforms.

Platform lifts shall be permitted to provide accessible routes to performance areas and speakers' platforms. [2010 ADA STANDARDS (DOJ): 206.7.1]

12.6.7.2 - Wheelchair Spaces.

Platform lifts shall be permitted to provide an accessible route to comply with the wheelchair space dispersion and line-of-sight requirements of Section 12.21 and ICC/ANSI A117.1, Section 802. [2010 ADA STANDARDS (DOJ): 206.7.2]

12.6.7.3 - Incidental Spaces.

Platform lifts shall be permitted to provide an accessible route to incidental spaces which are not public use spaces and which are occupied by five persons maximum. [2010 ADA STANDARDS (DOJ): 206.7.3]
12.6.7.4 - Judicial Spaces.
Platform lifts shall be permitted to provide an accessible route to: jury boxes and witness stands; raised courtroom stations including, judges' benches, clerks' stations, bailiffs' stations, deputy clerks' stations, and court reporters' stations; and to depressed areas such as the well of a court. [2010 ADA STANDARDS (DOJ): 206.7.4]

12.6.7.5 - Existing Site Constraints.
Platform lifts shall be permitted where existing exterior site constraints make use of a ramp or elevator infeasible. [2010 ADA STANDARDS (DOJ): 206.7.5]

12.6.7.6 - Guest Rooms and Residential Dwelling Units.
Platform lifts shall be permitted to connect levels within transient lodging guest rooms required to provide mobility features complying with 12.45.3.2 or residential dwelling units required to provide mobility features complying with 12.45.5.2 through 12.45.5.5. [2010 ADA STANDARDS (DOJ): 206.7.6]

12.6.7.7 - Amusement Rides.
Platform lifts shall be permitted to provide accessible routes to load and unload areas serving amusement rides. [2010 ADA STANDARDS (DOJ): 206.7.7]

12.6.7.8 - Play Areas.
Platform lifts shall be permitted to provide accessible routes to play components or soft contained play structures. [2010 ADA STANDARDS (DOJ): 206.7.8]

12.6.7.9 - Team or Player Seating.
Platform lifts shall be permitted to provide accessible routes to team or player seating areas serving areas of sport activity. [2010 ADA STANDARDS (DOJ): 206.7.9]

12.6.7.10 - Recreational Boating Facilities and Fishing Piers and Platforms.
Platform lifts shall be permitted to be used instead of gangways that are part of accessible routes serving recreational boating facilities and fishing piers and platforms. [2010 ADA STANDARDS (DOJ): 206.7.10]

12.6.8 - Security Barriers.
Security barriers including, but not limited to, security bollards and security check points, shall not obstruct a required accessible route or accessible means of egress. [2010 ADA STANDARDS (DOJ): 206.6.8]

Exception: Where security barriers incorporate elements that cannot comply with these requirements such as certain metal detectors, fluoroscopes, or other similar devices, the accessible route shall be permitted to be located adjacent to security screening devices. The accessible route shall permit persons with disabilities passing around security barriers to maintain visual contact with their personal items to the same extent provided others passing through the security barrier. [2010 ADA STANDARDS (DOJ): 206.8, Exception]

12.7 - Accessible Means of Egress.

Exception No. 1: Where means of egress are permitted by local building or life safety codes to share a common path of egress travel, accessible means of egress shall be permitted to share a common path of egress travel. [2010 ADA STANDARDS (DOJ): 207.1, Exception 1]

Exception No. 2: Areas of refuge shall not be required in detention and correctional facilities. [2010 ADA STANDARDS (DOJ): 207.1, Exception 2]

12.8 - Parking Spaces.
Where parking spaces are provided, parking spaces shall be provided in accordance with Section 12.8. 

**Exception:** Parking spaces used exclusively for buses, trucks, other delivery vehicles, law enforcement vehicles, or vehicular impound shall not be required to comply with Section 12.8 provided that lots accessed by the public are provided with a passenger loading zone complying with ICC/ANSI A117.1, Section 503.

**12.8.2** – Minimum Number.

Parking spaces complying with ICC/ANSI A117.1, Section 502 shall be provided in accordance with Table 12.8.2, except as required by 12.8.2.1 through 12.8.2.3. Where more than one parking facility is provided on a site, the number of accessible spaces provided on the site shall be calculated according to the number of spaces required for each parking facility.

**Table 12.8.2 Parking Spaces**

<table>
<thead>
<tr>
<th>Total Number of Parking Spaces Provided in Parking Facility</th>
<th>Minimum Number of Required Accessible Parking Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–25</td>
<td>1</td>
</tr>
<tr>
<td>26–30</td>
<td>2</td>
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<tr>
<td>51–75</td>
<td>3</td>
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<tr>
<td>76–100</td>
<td>4</td>
</tr>
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<td>101–150</td>
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<td>201–300</td>
<td>7</td>
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<tr>
<td>301–400</td>
<td>8</td>
</tr>
<tr>
<td>401–500</td>
<td>9</td>
</tr>
<tr>
<td>501–1000</td>
<td>2% of total ≥ 1001, plus 1 for every 100, or fraction thereof, &gt;1000</td>
</tr>
</tbody>
</table>

**12.8.2.1** – Ambulatory Health Care Occupancies.

Ten percent of patient and visitor parking spaces provided to serve ambulatory health care occupancies shall comply with ICC/ANSI A117.1, Section 502.

**12.8.2.2** – Rehabilitation Facilities and Outpatient Physical Therapy Facilities.

Twenty percent of patient and visitor parking spaces provided to serve rehabilitation facilities specializing in treating conditions that affect mobility and outpatient physical therapy facilities shall comply with ICC/ANSI A117.1, Section 502.

**12.8.2.3** – Residential Facilities.

Parking spaces provided to serve residential facilities shall comply with 12.8.2.3.

**12.8.2.3.1** – Parking for Residents.

Where at least one parking space is provided for each residential dwelling unit, at least one parking space complying with ICC/ANSI A117.1, Section 502 shall be provided for each residential dwelling unit required to provide mobility features complying with 12.45.5.2 through 12.45.5.5.

**12.8.2.3.2** – Additional Parking Spaces for Residents.

Where the total number of parking spaces provided for each residential dwelling unit exceeds one parking space per residential dwelling unit, 2 percent, but no fewer than one space, of all the parking spaces not covered by 12.8.2.3.1 shall comply with ICC/ANSI A117.1, Section 502.

**12.8.2.3.3** – Parking for Guests, Employees, and Other Non-Residents.

Where parking spaces are provided for persons other than residents, parking shall be provided in accordance with Table 12.8.2.
12.8.2.4 - Van Parking Spaces.

For every six or fraction of six parking spaces required by 12.8.2 to comply with ICC/ANSI A117.1, Section 502, at least one shall be a van parking space complying with ICC/ANSI A117.1, Section 502. [2010 ADA STANDARDS (DOJ): 208.2.4]

12.8.3 - Location.

Parking facilities shall comply with 12.8.3. [2010 ADA STANDARDS (DOJ): 208.3]

12.8.3.1 - General.

Parking spaces complying with ICC/ANSI A117.1, Section 502 that serve a particular building or facility shall be located on the shortest accessible route from parking to an entrance complying with 12.6.4. Where parking serves more than one accessible entrance, parking spaces complying with ICC/ANSI A117.1, Section 502 shall be dispersed and located on the shortest accessible route to the accessible entrances. In parking facilities that do not serve a particular building or facility, parking spaces complying with ICC/ANSI A117.1, Section 502 shall be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. [2010 ADA STANDARDS (DOJ): 208.3.1]

Exception No. 1: All van parking spaces shall be permitted to be grouped on one level within a multi-story parking facility. [2010 ADA STANDARDS (DOJ): 208.3.1, Exception 1]

Exception No. 2: Parking spaces shall be permitted to be located in different parking facilities if substantially equivalent or greater accessibility is provided in terms of distance from an accessible entrance or entrances, parking fee, and user convenience. [2010 ADA STANDARDS (DOJ): 208.3.1, Exception 2]

12.8.3.2 - Residential Facilities.

In residential facilities containing residential dwelling units required to provide mobility features complying with 12.45.5.2 through 12.45.5.5, parking spaces provided in accordance with 12.8.2.3.1 shall be located on the shortest accessible route to the residential dwelling unit entrance they serve. Spaces provided in accordance with 12.8.2.3.2 shall be dispersed throughout all types of parking provided for the residential dwelling units. [2010 ADA STANDARDS (DOJ): 208.3.2]

Exception: Parking spaces provided in accordance with 12.8.2.3.2 shall not be required to be dispersed throughout all types of parking if substantially equivalent or greater accessibility is provided in terms of distance from an accessible entrance, parking fee, and user convenience. [2010 ADA STANDARDS (DOJ): 208.3.2, Exception]

12.9 - Passenger Loading Zones and Bus Stops.

[2010 ADA STANDARDS (DOJ): 209]

12.9.1 - General.

Passenger loading zones shall be provided in accordance with Section 12.9. [2010 ADA STANDARDS (DOJ): 209.1]

12.9.2 - Type.

Where provided, passenger loading zones shall comply with 12.9.2. [2010 ADA STANDARDS (DOJ): 209.2]

12.9.2.1 - Passenger Loading Zones.

Passenger loading zones, except those required to comply with 12.9.2.2 and 12.9.2.3, shall provide at least one passenger loading zone complying with ICC/ANSI A117.1, Section 503 in every continuous 100 linear feet (30 linear meters) of loading zone space, or fraction thereof. [2010 ADA STANDARDS (DOJ): 209.2.1]
12.9.2.2  Bus Loading Zones.
In bus loading zones restricted to use by designated or specified public transportation vehicles, each bus bay, bus stop, or other area designated for lift or ramp deployment shall comply with ICC/ANSI A117.1, Section 805.2. [2010 ADA STANDARDS (DOJ): 209.2.2]

12.9.2.3  On-Street Bus Stops.
On-street bus stops shall comply with ICC/ANSI A117.1, Section 805.2 to the maximum extent practicable. [2010 ADA STANDARDS (DOJ): 209.2.3]

12.9.3  Health Care Occupancies and Residential Board and Care Occupancies.
At least one passenger loading zone complying with ICC/ANSI A117.1, Section 503 shall be provided at an accessible entrance to health care occupancies and residential board and care occupancies where the period of stay exceeds twenty-four hours. [2010 ADA STANDARDS (DOJ): 209.3]

12.9.4  Valet Parking.
Parking facilities that provide valet parking services shall provide at least one passenger loading zone complying with ICC/ANSI A117.1, Section 503. [2010 ADA STANDARDS (DOJ): 209.4]

12.9.5  Mechanical Access Parking Garages.
Mechanical access parking garages shall provide at least one passenger loading zone complying with ICC/ANSI A117.1, Section 503 at vehicle drop-off and vehicle pick-up areas. [2010 ADA STANDARDS (DOJ): 209.5]

12.10  Stairways.
[2010 ADA STANDARDS (DOJ): 210] Interior and exterior stairs that are part of a means of egress shall comply with Chapter 11 and ICC/ANSI A117.1, Section 504. [2010 ADA STANDARDS (DOJ): 210.1]

Exception No. 1: In detention and correctional facilities, stairs that are not located in public use areas shall not be required to comply with ICC/ANSI A117.1, Section 504. [2010 ADA STANDARDS (DOJ): 210.1, Exception 1]

Exception No. 2: In alterations, stairs between levels that are connected by an accessible route shall not be required to comply with ICC/ANSI A117.1, Section 504, except that handrails complying with ICC/ANSI A117.1, Section 505 shall be provided when the stairs are altered. [2010 ADA STANDARDS (DOJ): 210.1, Exception 2]

Exception No. 3: In assembly areas, aisle stairs shall not be required to comply with ICC/ANSI A117.1, Section 504. [2010 ADA STANDARDS (DOJ): 210.1, Exception 3]

Exception No. 4: Stairs that connect play components shall not be required to comply with ICC/ANSI A117.1, Section 504. [2010 ADA STANDARDS (DOJ): 210.1, Exception 4]

12.11  Drinking Fountains.
[2010 ADA STANDARDS (DOJ): 211]

12.11.1  General.
Where drinking fountains are provided on an exterior site, on a floor, or within a secured area they shall be provided in accordance with Section 12.11. [2010 ADA STANDARDS (DOJ): 211.1]

Exception: In detention or correctional facilities, drinking fountains only serving holding or housing cells not required to comply with Section 12.32 shall not be required to comply with Section 12.11. [2010 ADA STANDARDS (DOJ): 211.1, Exception]
12.11.2 * Minimum Number.
No fewer than two drinking fountains shall be provided. One drinking fountain shall comply with ICC/ANSI A117.1, Section 602.1 through 602.6 and one drinking fountain shall comply with ICC/ANSI A117.1, Section 602.7. [2010 ADA STANDARDS (DOJ): 211.2]

Exception: Where a single drinking fountain complies with ICC/ANSI A117.1, Section 602.1 through 602.7, it shall be permitted to be substituted for two separate drinking fountains. [2010 ADA STANDARDS (DOJ): 211.2, Exception]

12.11.3 More than Minimum Number.
Where more than the minimum number of drinking fountains specified in 12.11.2 are provided, 50 percent of the total number of drinking fountains provided shall comply with ICC/ANSI A117.1, Section 602.1 through 602.6, and 50 percent of the total number of drinking fountains provided shall comply with ICC/ANSI A117.1, Section 602.7. [2010 ADA STANDARDS (DOJ): 211.3]

Exception: Where 50 percent of the drinking fountains yields a fraction, 50 percent shall be permitted to be rounded up or down provided that the total number of drinking fountains complying with Section 12.11 equals 100 percent of drinking fountains. [2010 ADA STANDARDS (DOJ): 211.3, Exception]

12.12 Kitchens and Kitchenettes.
[2010 ADA STANDARDS (DOJ): 212]

12.12.1 General.
Where provided, kitchens, kitchenettes, and sinks shall comply with Section 12.12. [2010 ADA STANDARDS (DOJ): 212.1]

12.12.2 Technical Requirements.
Kitchens and kitchenettes shall comply with ICC/ANSI A117.1, Section 804. [2010 ADA STANDARDS (DOJ): 212.2]

12.12.3 Sinks.
Where sinks are provided, at least 5 percent, but no fewer than one, of each type provided in each accessible room or space shall comply with ICC/ANSI A117.1, Section 606. [2010 ADA STANDARDS (DOJ): 212.3]

Exception: Mop or service sinks shall not be required to comply with. 12.12.3 [2010 ADA STANDARDS (DOJ): 212.3, Exception]

12.13 Toilet Facilities and Bathing Facilities.
[2010 ADA STANDARDS (DOJ): 213]

12.13.1 General.
Where toilet facilities and bathing facilities are provided, they shall comply with Section 12.13. Where toilet facilities and bathing facilities are provided in facilities permitted by 12.6.2.3, Exception No. 1 and Exception No. 2 not to connect stories by an accessible route, toilet facilities and bathing facilities shall be provided on a story connected by an accessible route to an accessible entrance. [2010 ADA STANDARDS (DOJ): 213.1]

12.13.2 Toilet Rooms and Bathing Rooms.
12.13.2.1 - General.

Where toilet rooms are provided, each toilet room shall comply with ICC/ANSI A117.1, Section 603. Where bathing rooms are provided, each bathing room shall comply with ICC/ANSI A117.1, Section 603. [2010 ADA STANDARDS (DOJ): 213.2]

Exception No. 1: In alterations where it is technically infeasible to comply with ICC/ANSI A117.1, Section 603, altering existing toilet or bathing rooms shall not be required where a single unisex toilet room or bathing room complying with 12.13.2.2 is provided and located in the same area and on the same floor as existing inaccessible toilet or bathing rooms. [2010 ADA STANDARDS (DOJ): 213.2, Exception 1]

Exception No. 2: Where exceptions for alterations to qualified historic buildings or facilities are permitted by 12.2.5, no fewer than one toilet room for each sex complying with ICC/ANSI A117.1, Section 603 or one unisex toilet room complying with 12.13.2.2 shall be provided. [2010 ADA STANDARDS (DOJ): 213.2, Exception 2]

Exception No. 3: Where multiple single user portable toilet or bathing units are clustered at a single location, no more than 5 percent of the toilet units and bathing units at each cluster shall be required to comply with ICC/ANSI A117.1, Section 603. Portable toilet units and bathing units complying with ICC/ANSI A117.1, Section 603 shall be identified by the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1. [2010 ADA STANDARDS (DOJ): 213.2, Exception 3]

Exception No. 4: Where multiple single user toilet rooms are clustered at a single location, no more than 50 percent of the single user toilet rooms for each use at each cluster shall be required to comply with ICC/ANSI A117.1, Section 603. [2010 ADA STANDARDS (DOJ): 213.2, Exception 4]

12.13.2.2 - Unisex (Single-Use or Family) Toilet and Unisex Bathing Rooms.

Unisex toilet rooms shall contain not more than one lavatory, and two water closets without urinals or one water closet and one urinal. Unisex bathing rooms shall contain one shower or one shower and one bathtub, one lavatory, and one water closet. Doors to unisex toilet rooms and unisex bathing rooms shall have privacy latches. [2010 ADA STANDARDS (DOJ): 213.2.1]

12.13.3 - Plumbing Fixtures and Accessories.

Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with 12.13.2 shall comply with 12.13.3. [2010 ADA STANDARDS (DOJ): 213.3]

12.13.3.1 - Toilet Compartments.

Where toilet compartments are provided, at least one toilet compartment shall comply with ICC/ANSI A117.1, Section 604.8.1. In addition to the compartment required to comply with ICC/ANSI A117.1, Section 604.8.1, at least one compartment shall comply with ICC/ANSI A117.1, Section 604.8.2 where six or more toilet compartments are provided, or where the combination of urinals and water closets totals six or more fixtures. [2010 ADA STANDARDS (DOJ): 213.3.1]

12.13.3.2 - Water Closets.

Where water closets are provided, at least one shall comply with ICC/ANSI A117.1, Section 604. [2010 ADA STANDARDS (DOJ): 213.3.2]

12.13.3.3 - Urinals.

Where more than one urinal is provided, at least one shall comply with ICC/ANSI A117.1, Section 605. [2010 ADA STANDARDS (DOJ): 213.3.3]

12.13.3.4 - Lavatories.

Where lavatories are provided, at least one shall comply with ICC/ANSI A117.1, Section 606 and shall not be located in a toilet compartment. [2010 ADA STANDARDS (DOJ): 213.3.4]
12.13.3.5 – Mirrors.
Where mirrors are provided, at least one shall comply with ICC/ANSI A117.1, Section 603.3. [2010 ADA STANDARDS (DOJ): 213.3.5]

12.13.3.6 – Bathing Facilities.
Where bathtubs or showers are provided, at least one bathtub complying with ICC/ANSI A117.1, Section 607 or at least one shower complying with ICC/ANSI A117.1, Section 608 shall be provided. [2010 ADA STANDARDS (DOJ): 213.3.6]

12.13.3.7 – Coat Hooks and Shelves.
Where coat hooks or shelves are provided in toilet rooms without toilet compartments, at least one of each type shall comply with ICC/ANSI A117.1, Section 603.4. Where coat hooks or shelves are provided in toilet compartments, at least one of each type complying with ICC/ANSI A117.1, Section 604.8.3 shall be provided in toilet compartments required to comply with 12.13.3.1. Where coat hooks or shelves are provided in bathing facilities, at least one of each type complying with ICC/ANSI A117.1, Section 603.4 shall serve fixtures required to comply with 12.13.3.6. [2010 ADA STANDARDS (DOJ): 213.3.7]

12.14 – Washing Machines and Clothes Dryers.

[2010 ADA STANDARDS (DOJ): 214]

Where provided, washing machines and clothes dryers shall comply with Section 12.14. [2010 ADA STANDARDS (DOJ): 214.1]

Where three or fewer washing machines are provided, at least one shall comply with ICC/ANSI A117.1, Section 611. Where more than three washing machines are provided, at least two shall comply with ICC/ANSI A117.1, Section 611. [2010 ADA STANDARDS (DOJ): 214.2]

Where three or fewer clothes dryers are provided, at least one shall comply with ICC/ANSI A117.1, Section 611. Where more than three clothes dryers are provided, at least two shall comply with ICC/ANSI A117.1, Section 611. [2010 ADA STANDARDS (DOJ): 214.3]

12.15 – Fire Alarm Systems.
[2010 ADA STANDARDS (DOJ): 215]

12.15.1 – General.
Where fire alarm systems provide audible alarm coverage, alarms shall comply with Section 12.15. [2010 ADA STANDARDS (DOJ): 215.1]

Exception: In existing facilities, visible alarms shall not be required except where an existing fire alarm system is upgraded or replaced, or a new fire alarm system is installed. [2010 ADA STANDARDS (DOJ): 215.1, Exception]

12.15.2 – Public and Common Use Areas.
Alarms in public use areas and common use areas shall comply with NFPA 72, National Fire Alarm and Signaling Code. [2010 ADA STANDARDS (DOJ): 215.2]

12.15.3 – Employee Work Areas.
Where employee work areas have audible alarm coverage, the wiring system shall be designed so that visible alarms complying with NFPA 72 can be integrated into the alarm system. [2010 ADA STANDARDS (DOJ): 215.3]
12.15.4 - Transient Lodging.
Guest rooms required to comply with 12.24.4 shall provide alarms complying with NFPA 72.
[2010 ADA STANDARDS (DOJ): 215.4]

12.15.5 - Residential Facilities.
Where provided in residential dwelling units required to comply with 12.45.5.6, alarms shall comply with NFPA 72.
[2010 ADA STANDARDS (DOJ): 215.5]

12.16 - Signs.
[2010 ADA STANDARDS (DOJ): 216]

12.16.1 - General.
Signs shall be provided in accordance with Section 12.16 and shall comply with ICC/ANSI A117.1, Section 703.
[2010 ADA STANDARDS (DOJ): 216.1]

Exception No. 1: Building directories, menus, seat and row designations in assembly areas, occupant names, building addresses, and company names and logos shall not be required to comply with Section 12.16.
[2010 ADA STANDARDS (DOJ): 216.1, Exception 1]

Exception No. 2: In parking facilities, signs shall not be required to comply with 12.16.2, 12.16.3, and 12.16.6 through 12.16.12.
[2010 ADA STANDARDS (DOJ): 216.1, Exception 2]

Exception No. 3: Temporary, 7 days or less, signs shall not be required to comply with Section 12.16.
[2010 ADA STANDARDS (DOJ): 216.1, Exception 3]

Exception No. 4: In detention and correctional facilities, signs not located in public use areas shall not be required to comply with Section 12.16.
[2010 ADA STANDARDS (DOJ): 216.1, Exception 4]

12.16.2 * - Designations.
Interior and exterior signs identifying permanent rooms and spaces shall comply with ICC/ANSI A117.1, Section 703.1, 703.2, and 703.5. Where pictograms are provided as designations of permanent interior rooms and spaces, the pictograms shall comply with ICC/ANSI A117.1, Section 703.6 and shall have text descriptors complying with ICC/ANSI A117.1, Section 703.2 and ICC/ANSI A117.1, Section 703.5.
[2010 ADA STANDARDS (DOJ): 216.2]

Exception: Exterior signs that are not located at the door to the space they serve shall not be required to comply with ICC/ANSI A117.1, Section 703.2.
[2010 ADA STANDARDS (DOJ): 216.2, Exception]

12.16.3 * - Directional and Informational Signs.
Signs that provide direction to or information about interior spaces and facilities of the site shall comply with ICC/ANSI A117.1, Section 703.5.
[2010 ADA STANDARDS (DOJ): 216.3]

12.16.4 - Means of Egress.
Signs for means of egress shall comply with 12.16.4.
[2010 ADA STANDARDS (DOJ): 216.4]

12.16.4.1 * - Exit Doors.
Doors at exit passageways, exit discharge, and exit stairways shall be identified by tactile signs complying with ICC/ANSI A117.1, Section 703.1, 703.2, and 703.5.
[2010 ADA STANDARDS (DOJ): 216.4.1]

12.16.4.2 - Areas of Refuge.
Signs required by Section 11.10 or 11.2.12 to provide instructions in areas of refuge shall comply with ICC/ANSI A117.1, Section 703.5.
[2010 ADA STANDARDS (DOJ): 216.4.2]
12.16.4.3 - Directional Signs.

Signs required by Section 11.10 or 11.2.12 to provide directions to accessible means of egress shall comply with ICC/ANSI A117.1, Section 703.5. [2010 ADA STANDARDS (DOJ): 216.4.3]

12.16.5 - Parking.

Parking spaces complying with ICC/ANSI A117.1, Section 502 shall be identified by signs complying with ICC/ANSI A117.1, Section 502.6. [2010 ADA STANDARDS (DOJ): 216.5]

Exception No. 1: Where a total of four or fewer parking spaces, including accessible parking spaces, are provided on a site, identification of accessible parking spaces shall not be required. [2010 ADA STANDARDS (DOJ): 216.5, Exception 1]

Exception No. 2: In residential facilities, where parking spaces are assigned to specific residential dwelling units, identification of accessible parking spaces shall not be required. [2010 ADA STANDARDS (DOJ): 216.5, Exception 2]

12.16.6 - Entrances.

Where not all entrances comply with ICC/ANSI A117.1, Section 404, entrances complying with ICC/ANSI A117.1, Section 404 shall be identified by the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1. Directional signs complying with ICC/ANSI A117.1, Section 703.5 that indicate the location of the nearest entrance complying with ICC/ANSI A117.1, Section 404 shall be provided at entrances that do not comply with ICC/ANSI A117.1, Section 404. [2010 ADA STANDARDS (DOJ): 216.6]

12.16.7 - Elevators.

Where existing elevators do not comply with ICC/ANSI A117.1, Section 407, elevators complying with ICC/ANSI A117.1, Section 407 shall be clearly identified with the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1. [2010 ADA STANDARDS (DOJ): 216.7]

12.16.8 - Toilet Rooms and Bathing Rooms.

Where existing toilet rooms or bathing rooms do not comply with ICC/ANSI A117.1, Section 603, directional signs indicating the location of the nearest toilet room or bathing room complying with ICC/ANSI A117.1, Section 603 within the facility shall be provided. Signs shall comply with ICC/ANSI A117.1, Section 703.5 and shall include the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1. Where existing toilet rooms or bathing rooms do not comply with ICC/ANSI A117.1, Section 603, the toilet rooms or bathing rooms complying with ICC/ANSI A117.1, Section 603 shall be identified by the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1. Where clustered single user toilet rooms or bathing facilities are permitted to use exceptions to 12.13.2, toilet rooms or bathing facilities complying with ICC/ANSI A117.1, Section 603 shall be identified by the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1 unless all toilet rooms and bathing facilities comply with ICC/ANSI A117.1, Section 603. [2010 ADA STANDARDS (DOJ): 216.8]

12.16.9 - TTYs.

Identification and directional signs for public TTYs shall be provided in accordance with 12.16.9. [2010 ADA STANDARDS (DOJ): 216.9]

12.16.9.1 - Identification Signs.

Public TTYs shall be identified by the International Symbol of TTY complying with ICC/ANSI A117.1, Section 703.7.2.2. [2010 ADA STANDARDS (DOJ): 216.9.1]
12.16.9.2 Directional Signs.

Directional signs indicating the location of the nearest public TTY shall be provided at all banks of public pay telephones not containing a public TTY. In addition, where signs provide direction to public pay telephones, they shall also provide direction to public TTYs. Directional signs shall comply with ICC/ANSI A117.1, Section 703.5 and shall include the International Symbol of TTY complying with ICC/ANSI A117.1, Section 703.7.2.2. [2010 ADA STANDARDS (DOJ): 216.9.2]

12.16.10 Assistive Listening Systems.

Each assembly area required by Section 12.19 to provide assistive listening systems shall provide signs informing patrons of the availability of the assistive listening system. Assistive listening signs shall comply with ICC/ANSI A117.1, Section 703.5 and shall include the International Symbol of Access for Hearing Loss complying with ICC/ANSI A117.1, Section 703.7.2.4. [2010 ADA STANDARDS (DOJ): 216.10]

Exception: Where ticket offices or windows are provided, signs shall not be required at each assembly area provided that signs are displayed at each ticket office or window informing patrons of the availability of assistive listening systems. [2010 ADA STANDARDS (DOJ): 216.10, Exception]

12.16.11 Check-Out Aisles.

Where more than one check-out aisle is provided, check-out aisles complying with ICC/ANSI A117.1, Section 904.4 shall be identified by the International Symbol of Accessibility complying with ICC/ANSI A117.1, Section 703.7.2.1. Where check-out aisles are identified by numbers, letters, or functions, signs identifying check-out aisles complying with ICC/ANSI A117.1, Section 904.4 shall be located in the same location as the check-out aisle identification. [2010 ADA STANDARDS (DOJ): 216.11]

Exception: Where all check-out aisles serving a single function comply with ICC/ANSI A117.1, Section 904.4, signs complying with ICC/ANSI A117.1, Section 703.7.2.1 shall not be required. [2010 ADA STANDARDS (DOJ): 216.11, Exception]

12.16.12 Amusement Rides.

Signs identifying the type of access provided on amusement rides shall be provided at entries to queues and waiting lines. In addition, where accessible unload areas also serve as accessible load areas, signs indicating the location of the accessible load and unload areas shall be provided at entries to queues and waiting lines. [2010 ADA STANDARDS (DOJ): 216.12]

12.17 Telephones.

[2010 ADA STANDARDS (DOJ): 217]

12.17.1 General.

Where coin-operated public pay telephones, coinless public pay telephones, public closed-circuit telephones, public courtesy phones, or other types of public telephones are provided, public telephones shall be provided in accordance with Section 12.17 for each type of public telephone provided. For purposes of Section 12.17, a bank of telephones shall be considered to be two or more adjacent telephones. [2010 ADA STANDARDS (DOJ): 217.1]

12.17.2 Wheelchair Accessible Telephones.

Where public telephones are provided, wheelchair accessible telephones complying with ICC/ANSI A117.1, Section 704.2 shall be provided in accordance with Table 12.17.2. [2010 ADA STANDARDS (DOJ): 217.2]

Table 12.17.2 Wheelchair Accessible Telephones
Number of Telephones Provided on a Floor, Level, or Exterior Site Minimum Number of Required Wheelchair Accessible Telephones 1 or more single units 1 per floor, level, and

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12.17  \* - Volume Controls.

All public telephones shall have volume controls complying with ICC/ANSI A117.1, Section 704.3. [2010 ADA STANDARDS (DOJ): 217.3]

12.17.4 \* - TTYs.

TTYs complying with ICC/ANSI A117.1, Section 704.4 shall be provided in accordance with 12.17.4.1. [2010 ADA STANDARDS (DOJ): 217.4]

12.17.4.1 \* - Bank Requirement.

Where four or more public pay telephones are provided at a bank of telephones, at least one public TTY complying with ICC/ANSI A117.1, Section 704.4 shall be provided at that bank. [2010 ADA STANDARDS (DOJ): 217.4.1]

Exception: TTYs shall not be required at banks of telephones located within 200 ft (61 m) of, and on the same floor as, a bank containing a public TTY. [2010 ADA STANDARDS (DOJ): 217.4.1, Exception]

12.17.4.2 - Floor Requirement.

TTYs in public buildings shall be provided in accordance with 12.17.4.2.1. TTYs in private buildings shall be provided in accordance with 12.17.4.2.2. [2010 ADA STANDARDS (DOJ): 217.4.2]

12.17.4.2.1 - Public Buildings.

Where at least one public pay telephone is provided on a floor of a public building, at least one public TTY shall be provided on that floor. [2010 ADA STANDARDS (DOJ): 217.4.2.1]

12.17.4.2.2 - Private Buildings.

Where four or more public pay telephones are provided on a floor of a private building, at least one public TTY shall be provided on that floor. [2010 ADA STANDARDS (DOJ): 217.4.2.2]

12.17.4.3 - Building Requirement.

TTYs in public buildings shall be provided in accordance with 12.17.4.3.1. TTYs in private buildings shall be provided in accordance with 12.17.4.3.2. [2010 ADA STANDARDS (DOJ): 217.4.3]

12.17.4.3.1 - Public Buildings.

Where at least one public pay telephone is provided in a public building, at least one public TTY shall be provided in the building. Where at least one public pay telephone is provided in a public use area of a public building, at least one public TTY shall be provided in the public building in a public use area. [2010 ADA STANDARDS (DOJ): 217.4.3.1]

12.17.4.3.2 - Private Buildings.

Where four or more public pay telephones are provided in a private building, at least one public TTY shall be provided in the building. [2010 ADA STANDARDS (DOJ): 217.4.3.2]

12.17.4.4 - Exterior Site Requirement.

Where four or more public pay telephones are provided on an exterior site, at least one public TTY shall be provided on the site. [2010 ADA STANDARDS (DOJ): 217.4.4]
12.17.4.5 - Rest Stops, Emergency Roadside Stops, and Service Plazas.
Where at least one public pay telephone is provided at a public rest stop, emergency roadside stop, or service plaza, at least one public TTY shall be provided. [2010 ADA STANDARDS (DOJ): 217.4.5]

12.17.4.6 - Hospitals.
Where at least one public pay telephone is provided serving a hospital emergency room, hospital recovery room, or hospital waiting room, at least one public TTY shall be provided at each location. [2010 ADA STANDARDS (DOJ): 217.4.6]

12.17.4.7 - Transportation Facilities.
In transportation facilities, in addition to the requirements of 12.17.4.1 through 12.17.4.4, where at least one public pay telephone serves a particular entrance to a bus or rail facility, at least one public TTY shall be provided to serve that entrance. In airports, in addition to the requirements of 12.17.4.4, where four or more public pay telephones are located in a terminal outside the security areas, a concourse within the security areas, or a baggage claim area in a terminal, at least one public TTY shall be provided in each location. [2010 ADA STANDARDS (DOJ): 217.4.7]

12.17.4.8 - Detention and Correctional Facilities.
In detention and correctional facilities, where at least one pay telephone is provided in a secured area used only by detainees or inmates and security personnel, at least one TTY shall be provided in at least one secured area. [2010 ADA STANDARDS (DOJ): 217.4.8]

12.17.5 - Shelves for Portable TTYs.
Where a bank of telephones in the interior of a building consists of three or more public pay telephones, at least one public pay telephone at the bank shall be provided with a shelf and an electrical outlet in accordance with ICC/ANSI A117.1, Section 704.5. [2010 ADA STANDARDS (DOJ): 217.5]

Exception No. 1: Secured areas of detention and correctional facilities where shelves and outlets are prohibited for purposes of security or safety shall not be required to comply with 12.17.5. [2010 ADA STANDARDS (DOJ): 217.5, Exception 1]

Exception No. 2: The shelf and electrical outlet shall not be required at a bank of telephones with a TTY. [2010 ADA STANDARDS (DOJ): 217.5, Exception 2]

12.18 - Transportation Facilities.
[2010 ADA STANDARDS (DOJ): 218]

12.18.1 - General.
Transportation facilities shall comply with Section 12.18. [2010 ADA STANDARDS (DOJ): 218.1]

12.18.2 - New and Altered Fixed Guideway Stations.
New and altered stations in rapid rail, light rail, commuter rail, intercity rail, high speed rail, and other fixed guideway systems shall comply with ICC/ANSI A117.1, Section 805.5 through 805.10. [2010 ADA STANDARDS (DOJ): 218.2]

12.18.3 - Key Stations and Existing Intercity Rail Stations.
Key stations and existing intercity rail stations shall comply with ICC/ANSI A117.1, Section 805.5 through 805.10. [2010 ADA STANDARDS (DOJ): 218.3]

12.18.4 - Bus Shelters.
Where provided, bus shelters shall comply with ICC/ANSI A117.1, Section 805.3. [2010 ADA STANDARDS (DOJ): 218.4]
12.18.5 Other Transportation Facilities.

In other transportation facilities, public address systems shall comply with ICC/ANSI A117.1, Section 805.7 and clocks shall comply with ICC/ANSI A117.1, Section 805.8. [2010 ADA STANDARDS (DOJ): 218.5]

12.19 Assistive Listening Systems.

[2010 ADA STANDARDS (DOJ): 219]

12.19.1 General.

Assistive listening systems shall be provided in accordance with Section 12.19 and shall comply with ICC/ANSI A117.1, Section 706. [2010 ADA STANDARDS (DOJ): 219.1]

12.19.2 Required Systems.

In each assembly area where audible communication is integral to the use of the space, an assistive listening system shall be provided. [2010 ADA STANDARDS (DOJ): 219.2]

Exception: Other than in courtrooms, assistive listening systems shall not be required where audio amplification is not provided. [2010 ADA STANDARDS (DOJ): 219.2, Exception]

12.19.3 Receivers.

Receivers complying with ICC/ANSI A117.1, Section 706.2 shall be provided for assistive listening systems in each assembly area in accordance with Table 12.19.3. Twenty-five percent minimum of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with ICC/ANSI A117.1, Section 706.3. [2010 ADA STANDARDS (DOJ): 219.3]

Table 12.19.3 Receivers for Assistive Listening Systems

<table>
<thead>
<tr>
<th>Capacity of Seating in Assembly Area</th>
<th>Minimum Number of Required Receivers</th>
<th>Minimum Number of Required Receivers Required to Be Hearing-Aid Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 50 seats</td>
<td>2</td>
<td>2, plus 1 per 25 seats†</td>
</tr>
<tr>
<td>&gt;50 seats, ≤ 200 seats</td>
<td>2, plus 1 per 25 seats†</td>
<td>1 per 4 receivers †</td>
</tr>
<tr>
<td>&gt;201 seats, ≤ 500 seats</td>
<td>2, plus 1 per 33 seats†</td>
<td>1 per 4 receivers †</td>
</tr>
<tr>
<td>&gt;501 seats, ≤ 1000 seats</td>
<td>2, plus 1 per 33 seats†</td>
<td>1 per 4 receivers †</td>
</tr>
<tr>
<td>&gt;1001 seats, ≤ 2000 seats</td>
<td>2, plus 1 per 33 seats†</td>
<td>1 per 4 receivers †</td>
</tr>
<tr>
<td>&gt;2001 seats</td>
<td>2, plus 1 per 33 seats†</td>
<td>1 per 4 receivers †</td>
</tr>
</tbody>
</table>

† Or fraction thereof.

Exception No. 1: Where a building contains more than one assembly area and the assembly areas required to provide assistive listening systems are under one management, the total number of required receivers shall be permitted to be calculated according to the total number of seats in the assembly areas in the building provided that all receivers are usable with all systems. [2010 ADA STANDARDS (DOJ): 219.3, Exception 1]

Exception No. 2: Where all seats in an assembly area are served by an induction loop assistive listening system, the minimum number of receivers required by Table 12.19.3 to be hearing-aid compatible shall not be required to be provided. [2010 ADA STANDARDS (DOJ): 219.3, Exception 2]

12.20 Automatic Teller Machines and Fare Machines.

[2010 ADA STANDARDS (DOJ): 220] Where automatic teller machines or self-service fare vending, collection, or adjustment machines are provided, at least one of each type provided at each location shall comply with ICC/ANSI A117.1, Section 707. Where bins are provided for envelopes, waste paper, or other purposes, at least one of each type shall comply with 12.45.7. [2010 ADA STANDARDS (DOJ): 220.1]

12.21 Assembly Areas.

[2010 ADA STANDARDS (DOJ): 221]
Assembly areas shall provide wheelchair spaces, companion seats, and designated aisle seats complying with Section 12.21, and ICC/ANSI A117.1, Section 802. In addition, lawn seating shall comply with Table 12.21.5. [2010 ADA STANDARDS (DOJ): 221.1]

12.21.2 Wheelchair Spaces.

Wheelchair spaces complying with 12.21.2 shall be provided in assembly areas with fixed seating. [2010 ADA STANDARDS (DOJ): 221.2]

12.21.2.1 Number and Location.

Wheelchair spaces shall be provided complying with 12.21.2.1. [2010 ADA STANDARDS (DOJ): 221.2.1]

Table 12.21.2.1.1 Number of Wheelchair Spaces in Assembly Areas

<table>
<thead>
<tr>
<th>Number of Seats</th>
<th>Minimum Number of Required Wheelchair Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–25</td>
<td>1</td>
</tr>
<tr>
<td>26–50</td>
<td>2</td>
</tr>
<tr>
<td>51–150</td>
<td>4</td>
</tr>
<tr>
<td>151–300</td>
<td>5</td>
</tr>
<tr>
<td>301–500</td>
<td>6</td>
</tr>
<tr>
<td>≥5001</td>
<td>36, plus 1 for each 200, or fraction thereof, &gt;5000</td>
</tr>
</tbody>
</table>

[2010 ADA STANDARDS (DOJ): Table 221.2.1.1]

12.21.2.2 Integration.

Wheelchair spaces shall be an integral part of the seating plan. [2010 ADA STANDARDS (DOJ): 221.2.2]
12.21.2.2.2 Wheelchair spaces and companion seats shall not be located on, or obstructed by, temporary platforms or other movable structures.

Exception: When an entire seating section is placed on temporary platforms or other movable structures in order to increase seating for an event in an area where fixed seating is not provided, wheelchair spaces and companion seats are not required to accommodate persons eligible for those spaces and seats, individual, removable seats may be placed in those spaces and seats.

12.21.2.2.3 Stadium-style movie theaters shall locate wheelchair spaces and companion seats on a rise or cross-aisle in the stadium section that satisfies at least one of the following criteria:

1. It is located within the rear 60% of the seats provided in an auditorium; or
2. It is located within the area of an auditorium in which the vertical viewing angles (as measured to the top of the screen) are from the 40th to the 100th percentile of vertical viewing angles for all seats as ranked from the seats in the first row (1st percentile) to seats in the back row (100th percentile). [DOJ 221.2.3.2]

12.21.2.3 Lines of Sight and Dispersion. Wheelchair spaces shall provide lines of sight complying with ICC/ANSI A117.1, Section 802.2 and shall comply with 12.21.2.3. In providing lines of sight, wheelchair spaces shall be dispersed. Wheelchair spaces shall provide spectators with choices of seating locations and viewing angles that are substantially equivalent to, or better than, the choices of seating locations and viewing angles available to all other spectators. When the number of wheelchair spaces required by 12.21.2.1 has been met, further dispersion shall not be required. [2010 ADA STANDARDS (DOJ): 221.2.3]

Exception: Wheelchair spaces in team or player seating areas serving areas of sport activity shall not be required to comply with 12.21.2.3. [2010 ADA STANDARDS (DOJ): 221.2.3, Exception]

12.21.2.3.1 Horizontal Dispersion.

Wheelchair spaces shall be dispersed horizontally. [2010 ADA STANDARDS (DOJ): 221.2.3.1]

12.21.2.3.1.1 Assembly areas that have seating encircling, in whole or in part, a field of play or performance area shall disperse wheelchair spaces and companion seats around that field of play or performance area. [DOJ 221.2.3.2]

Exception No. 1: Horizontal dispersion shall not be required in assembly areas with 300 or fewer seats if the companion seats required by 12.21.3 and wheelchair spaces are located within the second or third quartile of the total row length. Intermediate aisles shall be included in determining the total row length. If the row length in the second and third quartile of a row is insufficient to accommodate the required number of companion seats and wheelchair spaces, the additional companion seats and wheelchair spaces shall be permitted to be located in the first and fourth quartile of the row. [2010 ADA STANDARDS (DOJ): 221.2.3.1, Exception 1]

Exception No. 2: In row seating, two wheelchair spaces shall be permitted to be located side-by-side. [2010 ADA STANDARDS (DOJ): 221.2.3.1, Exception 2]

12.21.2.3.2 Vertical Dispersion.
12.21.2.3.2.1
Wheelchair spaces shall be dispersed vertically at varying distances from the screen, performance area, or playing field. In addition, wheelchair spaces shall be located in each balcony or mezzanine that is located on an accessible route. [2010 ADA STANDARDS (DOJ): 221.2.3.2]

12.21.2.3.2.2
In stadiums, arenas, and grandstands, wheelchair spaces and companion seats shall be dispersed to all levels that include seating served by an accessible route. [DOJ 221.2.3.2]

Exception No. 1: Vertical dispersion shall not be required in assembly areas with 300 or fewer seats if the wheelchair spaces provide viewing angles that are equivalent to, or better than, the average viewing angle provided in the facility. [2010 ADA STANDARDS (DOJ): 221.2.3.2, Exception 1]

Exception No. 2: In bleachers, wheelchair spaces shall not be required to be provided in rows other than rows at points of entry to bleacher seating. [2010 ADA STANDARDS (DOJ): 221.2.3.2, Exception 2]

12.21.3 – Companion Seats.

At least one companion seat complying with ICC/ANSI A117.1, Section 802.3 shall be provided for each wheelchair space required by 12.21.2.1. [2010 ADA STANDARDS (DOJ): 221.3]

12.21.4 – Designated Aisle Seats.

At least 5 percent of the total number of aisle seats provided shall comply with ICC/ANSI A117.1, Section 802.4 and shall be the aisle seats located closest to accessible routes. [2010 ADA STANDARDS (DOJ): 221.4]

Exception: Team or player seating areas serving areas of sport activity shall not be required to comply with 12.21.4. [2010 ADA STANDARDS (DOJ): 221.4, Exception]

12.21.5 – Lawn Seating.

Lawn seating areas and exterior overflow seating areas, where fixed seats are not provided, shall connect to an accessible route. [2010 ADA STANDARDS (DOJ): 221.5]

12.22 – Dressing, Fitting, and Locker Rooms.

[2010 ADA STANDARDS (DOJ): 222]

12.22.1 – General.

Where dressing rooms, fitting rooms, or locker rooms are provided, at least 5 percent, but no fewer than one, of each type of use in each cluster provided shall comply with ICC/ANSI A117.1, Section 803. [2010 ADA STANDARDS (DOJ): 222.1]

Exception: In alterations, where it is technically infeasible to provide rooms in accordance with 12.22.1, one room for each sex on each level shall comply with ICC/ANSI A117.1, Section 803. Where only unisex rooms are provided, unisex rooms shall be permitted. [2010 ADA STANDARDS (DOJ): 222.1, Exception]

12.22.2 – Coat Hooks and Shelves.

Where coat hooks or shelves are provided in dressing, fitting, or locker rooms without individual compartments, at least one of each type shall comply with ICC/ANSI A117.1, Section 903.5. Where coat hooks or shelves are provided in individual compartments, at least one of each type complying with ICC/ANSI A117.1, Section 803.5 shall be provided in individual compartments in dressing, fitting, or locker rooms required to comply with 12.22.1. [2010 ADA STANDARDS (DOJ): 222.2]

12.23 – Health Care Occupancies and Residential Board and Care Occupancies.
In health care occupancies and residential board and care occupancies where the period of stay exceeds 24 hours, patient or resident sleeping rooms shall be provided in accordance with Section 12.23.  

Exception: Toilet rooms that are part of critical or intensive care patient sleeping rooms shall not be required to comply with ICC/ANSI A117.1, Section 603.  

12.23.1  Alterations.  
Where sleeping rooms are altered or added, the requirements of Section 12.23 shall apply only to the sleeping rooms being altered or added until the number of sleeping rooms complies with the minimum number required for new construction.  

12.23.2 – Health Care Occupancies and Residential Board and Care Occupancies.  
Health care occupancies and residential board and care occupancies shall comply with Section 12.23.  

12.23.3 – Facilities Not Specializing in Treating Conditions That Affect Mobility.  

In facilities not specializing in treating conditions that affect mobility, at least 10 percent, but no fewer than one, of the patient sleeping rooms shall provide mobility features complying with 12.45.2.  

12.23.4 – Facilities Specializing in Treating Conditions That Affect Mobility.  

In facilities specializing in treating conditions that affect mobility, 100 percent of the patient sleeping rooms shall provide mobility features complying with 12.45.2.  

12.23.5 – Nursing Homes and Residential Board and Care Occupancies.  

In nursing homes and residential board and care occupancies, at least 50 percent, but no fewer than one, of each type of resident sleeping room shall provide mobility features complying with 12.45.2.  

12.24 – Hotel and Motel and Lodging and Rooming House Guest Rooms.  

Hotels and motels and lodging or rooming house occupancies shall provide guest rooms in accordance with Section 12.24 and in a number required by Table 12.24.1.  

<table>
<thead>
<tr>
<th>NFPA Occupancy</th>
<th>2010 ADA STANDARDS (DOJ) Requirements</th>
<th>2010 ADA STANDARDS (DOJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel, lodging or rooming house, Dormitory Transient</td>
<td>See Table 12.24.2 and Table 12.24.4</td>
<td></td>
</tr>
<tr>
<td>Hotel, dormitory lodging or rooming house Nontransient</td>
<td>See 12.33.</td>
<td></td>
</tr>
</tbody>
</table>

a Occupants are generally charged by the day and stay for less than 30 days.
b Occupants are generally charged by the month and stay for more than 30 days.
12.24.1.1 * -- Alterations.

Where guest rooms are altered or added, the requirements of Section 12.24 shall apply only to the guest rooms being altered or added until the number of guest rooms complies with the minimum number required for new construction. [2010 ADA STANDARDS (DOJ): 224.1.1]

12.24.1.2 * -- Guest Room Doors and Doorways.

Entrances, doors, and doorways providing user passage into and within guest rooms that are not required to provide mobility features complying with 12.45.3.2 shall comply with ICC/ANSI A117.1, Section 404.2.3. [2010 ADA STANDARDS (DOJ): 224.1.2]

Exception: Shower and sauna doors in guest rooms that are not required to provide mobility features complying with 12.45.3.2 shall not be required to comply with ICC/ANSI A117.1, Section 404.2.3. [2010 ADA STANDARDS (DOJ): 224.1.2, Exception]

12.24.2 -- Guest Rooms with Mobility Features.

In hotels and motels and lodging or rooming house occupancies, guest rooms with mobility features complying with 12.45.3.2 shall be provided in accordance with Table 12.24.2. [2010 ADA STANDARDS (DOJ): 224.2]

Table 12.24.2 Guest Rooms with Mobility Features

<table>
<thead>
<tr>
<th>Total Number of Guest Rooms Provided</th>
<th>Minimum Number of Required Rooms Without Roll-In Showers</th>
<th>Minimum Number of Required Rooms with Roll-In Showers</th>
<th>Total Number of Required Rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–25</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>26–50</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>51–75</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>76–100</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>101–150</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>151–200</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>201–300</td>
<td>7</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>301–400</td>
<td>8</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>≥1000</td>
<td>9</td>
<td>4</td>
<td>17</td>
</tr>
</tbody>
</table>

[2010 ADA STANDARDS (DOJ): Table 224.2]

12.24.3 -- Beds.

In guest rooms having more than 25 beds, 5 percent minimum of the beds shall have clear floor space complying with 12.45.3.2. [2010 ADA STANDARDS (DOJ): 224.3]

12.24.4 -- Guest Rooms with Communication Features.

In hotels and motels and lodging or rooming house occupancies, guest rooms with communication features complying with 12.45.3.3 shall be provided in accordance with Table 12.24.4. [2010 ADA STANDARDS (DOJ): 224.4]

Table 12.24.4 Guest Rooms with Communication Features

<table>
<thead>
<tr>
<th>Total Number of Guest Rooms Provided</th>
<th>Minimum Number of Required Guest Rooms with Communication Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–25</td>
<td>2</td>
</tr>
<tr>
<td>26–50</td>
<td>4</td>
</tr>
<tr>
<td>51–75</td>
<td>5</td>
</tr>
<tr>
<td>76–100</td>
<td>7</td>
</tr>
<tr>
<td>101–150</td>
<td>9</td>
</tr>
<tr>
<td>151–200</td>
<td>12</td>
</tr>
<tr>
<td>201–300</td>
<td>14</td>
</tr>
<tr>
<td>301–400</td>
<td>17</td>
</tr>
<tr>
<td>401–500</td>
<td>19</td>
</tr>
<tr>
<td>≥1001</td>
<td>22</td>
</tr>
</tbody>
</table>

[2010 ADA STANDARDS (DOJ): Table 224.4]

12.24.5 * -- Dispersion.

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12.24.5.1 -
Guest rooms required to provide mobility features complying with 12.45.3.2 and guest rooms required to provide communication features complying with 12.45.3 shall be dispersed among the various classes of guest rooms and shall provide choices of types of guest rooms, number of beds, and other amenities comparable to the choices provided to other guests. Where the minimum number of guest rooms required to comply with 12.45.3 is not sufficient to allow for complete dispersion, guest rooms shall be dispersed in the following priority: guest room type, number of beds, and amenities. At least one guest room required to provide mobility features complying with 12.45.3.2 shall also provide communication features complying with 12.45.3.3. Not more than 10 percent of guest rooms required to provide mobility features complying with 12.45.3.2 shall be used to satisfy the minimum number of guest rooms required to provide communication features complying with 12.45.3.3. [2010 ADA STANDARDS (DOJ): 224.5]

12.24.5.2 -
Facilities that are subject to the same permit application on a common site that each have 50 or fewer guest rooms may be combined for the purposes of determining the required number of accessible rooms and type of accessible rooms and type of accessible bathing facility in accordance with table 12.24.2.

12.24.5.3 -
Facilities with more than 50 guest rooms shall be treated separately for the purposes of determining the required number of accessible bathing facility in accordance with table 12.24.2.

Exception: Alterations to guest rooms in places of lodging where the guest rooms are not owned or substantially controlled by the entity that owns, leases, or operates the overall facility and the physical features of the guest room interiors are controlled by their individual owners are not required to comply with §36.402 or the alterations requirements in section 224.1.1 of the 2010 Standards.

12.24.5.4 -
Residential dwelling units that are designed and constructed for residential use exclusively are not subject to the transient lodging standards.

12.24.5.5 - Housing at a place of education.

12.24.5.5.1 -
Kitchens within housing units containing accessible sleeping rooms with mobility features (including suites and clustered sleeping rooms) or on floors containing accessible sleeping rooms with mobility features shall provide turning spaces that comply with 809.2.2 of ICC/ANSI A117.1 and kitchen work surfaces that comply with section 804.3 of ICC/ANSI A117.1.

12.24.5.5.2 -
Multi-bedroom housing units containing accessible sleeping rooms with mobility features shall have an accessible route throughout the unit in accordance with section 809.2 of ICC/ANSI A117.1.

12.24.5.5.3 -
Apartments or townhouse facilities that are provided by or on behalf of a place of education, which are leased on a year-round basis exclusively to graduate students or faculty and do not contain any public-use or common use areas available for educational programming, are not subject to the transient lodging standards and shall comply with the requirements for residential facilities in sections 12.33 and 809 of ICC/ANSI A117.1.

12.25 - Storage.

[2010 ADA STANDARDS (DOJ): 225] Storage facilities shall comply with Section 12.25.

[2010 ADA STANDARDS (DOJ): 225.1]
12.25.1 * -- General.
Where storage is provided in accessible spaces, at least one of each type shall comply with 
12.45.7 *[2010 ADA STANDARDS (DOJ): 225.2]

12.25.2 * -- Lockers.
Where lockers are provided, at least 5 percent, but no fewer than one of each type, shall 
comply with 12.45.7 *[2010 ADA STANDARDS (DOJ): 225.2.1]

12.25.3 * -- Self-Service Shelving.
Self-service shelves shall be located on an accessible route complying with 402 of ICC/ANSI 
A117.1. Self-service shelving shall not be required to comply with 308 of ICC/ANSI A117.1. Self-
service shelves shall be located on an accessible route complying with 402 of ICC/ANSI 
A117.1. Self-service shelving shall not be required to comply with 308 of ICC/ANSI A117.1.

12.25.4 * -- Self-Service Storage Facilities.

12.25.4.1 General.
Self-service storage facilities shall provide individual self-service storage spaces complying with 
these requirements in accordance with Table 12.25.4.1 *[2010 ADA STANDARDS (DOJ): 225.3]

Table 12.25.4.1 Self-Service Storage Facilities
Total Spaces in Facility Minimum Number of Spaces Required to be Accessible 1–200 5 percent, 
but no fewer than 1 ≥201 10, plus 2 percent of total number of units >200
[2010 ADA STANDARDS (DOJ): Table 225.3]

12.25.4.2 Dispersion.
Individual self-service storage spaces shall be dispersed throughout the various classes of 
spaces provided. Where more classes of spaces are provided than the number required to be 
accessible, the number of spaces shall not be required to exceed that required by Table 
12.25.4.1. Self-service storage spaces complying with Table 12.25.4.1 shall not be required to be dispersed among buildings in a multi-building facility. *[2010 ADA STANDARDS (DOJ): 225.3.1]

12.26 -- Dining Surfaces and Work Surfaces.
[2010 ADA STANDARDS (DOJ): 226]

Where dining surfaces are provided for the consumption of food or drink, at least 5 percent of 
the seating spaces and standing spaces at the dining surfaces shall comply with ICC/ANSI 
A117.1, Section 902. In addition, where work surfaces are provided for use by other than 
employees, at least 5 percent shall comply with ICC/ANSI A117.1, Section 902. *[2010 ADA STANDARDS (DOJ): 226.1]

Exception No. 1: Sales counters and service-counters shall not be required to comply with 
ICC/ANSI A117.1, Section 902. *[2010 ADA STANDARDS (DOJ): 226.1, Exception 1]

Exception No. 2: Check writing surfaces provided at check-out aisles not required to comply 
with ICC/ANSI A117.1, Section 904.4 shall not be required to comply with ICC/ANSI A117.1, 
Section 902. *[2010 ADA STANDARDS (DOJ): 226.1, Exception 2]

12.26.2 Dispersion.
Dining surfaces and work surfaces required to comply with ICC/ANSI A117.1, Section 902 shall 
be dispersed throughout the space or facility containing dining surfaces and work surfaces. 
[2010 ADA STANDARDS (DOJ): 226.2]

12.27 -- Sales and Service.
12.27 General.
Where provided, check-out aisles, sales counters, service counters, food service lines, queues, and waiting lines shall comply with Section 12.27 and ICC/ANSI A117.1, Section 904. [2010 ADA STANDARDS (DOJ): 227.1]

12.27.2 Check-Out Aisles.
Where check-out aisles are provided, check-out aisles complying with ICC/ANSI A117.1, Section 904.4 shall be provided in accordance with Table 12.27.2. Where check-out aisles serve different functions, check-out aisles complying with ICC/ANSI A117.1, Section 904.4 shall be provided in accordance with Table 12.27.2 for each function. Where check-out aisles are dispersed throughout the building or facility, check-out aisles complying with ICC/ANSI A117.1, Section 904.4 shall be dispersed. [2010 ADA STANDARDS (DOJ): 227.2]

Table 12.27.2 Check-Out Aisles
Number of Check-Out Aisles of Each Function | Minimum Number of Check-Out Aisles of Each Function Required to Comply with ICC/ANSI A117.1, Section 904.4
--- | ---
1–4 | 1
5–8 | 2
9–15 | 3
≥16 | 3, plus 20 percent of additional aisles

Exception: Where the selling space is under 5000 ft² (465 m²), no more than one check-out aisle complying with ICC/ANSI A117.1, Section 904.4 shall be required. [2010 ADA STANDARDS (DOJ): 227.2, Exception]

12.27.3 Altered Check-Out Aisles.
Where check-out aisles are altered, at least one of each check-out aisle serving each function shall comply with ICC/ANSI A117.1, Section 904.4 until the number of check-out aisles complies with 12.27.2. [2010 ADA STANDARDS (DOJ): 227.3]

12.28 Counters.
Where provided, at least one of each type of sales counter and service counter shall comply with ICC/ANSI A117.1, Section 904.3. Where counters are dispersed throughout the building or facility, counters complying with ICC/ANSI A117.1, Section 904.3 also shall be dispersed. [2010 ADA STANDARDS (DOJ): 228.3]

12.28.1 General.
Where provided, at least one of each type of depository, vending machine, change machine, and fuel dispenser shall comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 228.1]
12.28.2 – Mail Boxes.
Where mail boxes are provided in an interior location, at least 5 percent, but no fewer than one, of each type shall comply with ICC/ANSI A117.1, Section 309. In residential facilities, where mail boxes are provided for each residential dwelling unit, mail boxes complying with ICC/ANSI A117.1, Section 309 shall be provided for each residential dwelling unit required to provide mobility features complying with 12.45.4.2 through 12.45.4.5. [2010 ADA STANDARDS (DOJ): 228.2]

12.29 – Windows.
[2010 ADA STANDARDS (DOJ): 229] Where glazed openings are provided in accessible rooms or spaces for operation by occupants, at least one opening shall comply with ICC/ANSI A117.1, Section 309. Each glazed opening required by an administrative authority to be operable shall comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): 229.1]

Exception No. 1: Glazed openings in residential dwelling units required to comply with 12.45.5 shall not be required to comply with Section 12.29. [2010 ADA STANDARDS (DOJ): 229.1, Exception 1]

Exception No. 2: Glazed openings in guest rooms required to provide communication features and in guest rooms required to comply with 12.6.5.3 shall not be required to comply with Section 12.29. [2010 ADA STANDARDS (DOJ): 229.1, Exception 2]

[2010 ADA STANDARDS (DOJ): 230] Where a two-way communication system is provided to gain admittance to a building or facility or to restricted areas within a building or facility, the system shall comply with ICC/ANSI A117.1, Section 708. [2010 ADA STANDARDS (DOJ): 230.1]

12.31 – Judicial Facilities.
[2010 ADA STANDARDS (DOJ): 231]

12.31.1 – General.
Judicial facilities shall comply with Section 12.31. [2010 ADA STANDARDS (DOJ): 231]

12.31.2 – Courtrooms.
Each courtroom shall comply with ICC/ANSI A117.1, Section 808. [2010 ADA STANDARDS (DOJ): 231.2]

12.31.3 – Holding Cells.
Where provided, central holding cells and court-floor holding cells shall comply with 12.31.3. [2010 ADA STANDARDS (DOJ): 231.3]

12.31.3.1 – Central Holding Cells.
Where separate central holding cells are provided for an adult male, a juvenile male, an adult female, or a juvenile female, one of each type shall comply with 12.45.4.2. Where central holding cells are provided and are not separated by age or sex, at least one cell complying with 12.45.4.2 shall be provided. [2010 ADA STANDARDS (DOJ): 231.3.1]

12.31.3.2 – Court-Floor Holding Cells.
Where separate court-floor holding cells are provided for an adult male, a juvenile male, an adult female, or a juvenile female, each courtroom shall be served by one cell of each type complying with 12.45.4.2. Where court-floor holding cells are provided and are not separated by age or sex, courtrooms shall be served by at least one cell complying with 12.45.4.2. Cells may serve more than one courtroom. [2010 ADA STANDARDS (DOJ): 231.3.2]

12.31.4 – Visiting Areas.
Visiting areas shall comply with 12.31.4.  

12.31.4.1 Cubicles and Counters.

At least 5 percent, but no fewer than one, of cubicles shall comply with ICC/ANSI A117.1, Section 902 on both the visitor and detainee sides. Where counters are provided, at least one shall comply with ICC/ANSI A117.1, Section 904.3.2 on both the visitor and detainee sides.  

Exception: The detainee side of cubicles or counters at non-contact visiting areas not serving holding cells required to comply with Section 12.31.4.1 shall not be required to comply with ICC/ANSI A117.1, Section 902 or 904.3.2.  

12.31.4.2 Partitions.

Where solid partitions or security glazing separate visitors from detainees, at least one of each type of cubicle or counter partition shall comply with ICC/ANSI A117.1, Section 904.6.  

12.32 Detention Facilities and Correctional Facilities.

12.32.1 General.

Buildings, facilities, or portions thereof, in which people are detained for penal or correction purposes, or in which the liberty of the inmates is restricted for security reasons shall comply with Section 12.32.  

12.32.2 General Holding Cells and General Housing Cells.

General holding cells and general housing cells shall be provided in accordance with 12.32.2.  

Exception: Alterations to cells shall not be required to comply except to the extent determined by the Attorney General.  

12.32.2.1 Cells with Mobility Features.

At least 2 percent, but no fewer than one, of the total number of cells in a facility shall provide mobility features complying with 12.45.4.2.  

12.32.2.1.2 New construction of jails, prisons, and other detention and correctional facilities of public entities shall:

12.32.2.1.2.1 Provide accessible mobility features complying with 807.2 of ICC/ANSI A117.1 for a minimum of 3%, but not fewer than one, of the total number of cells in a facility.

12.32.2.1.2.2 Provide cells with mobility features in each classification level.

12.32.2.1.3 Alterations to jails, prisons, and other detention and correctional facilities of public entities shall:
12.32.2.1.3.1

Provide accessible mobility features complying with 807.2 of ICC ANSI A117.1 for a minimum of 3%, but no fewer than one, of the total number of cells being altered until at least 3%, but no fewer than one, of the total number of cells in a facility shall provide mobility features complying with 807.2 of ICC/ANSI A117.1.

12.32.2.1.3.2

Provide altered cells with mobility features in each classification level.

**Exception No. 1:** When alterations are made to specific cells, detention and correctional facility operators shall be permitted to comply with 12.32.2.1.3.1 and 12.32.2.1.3.2 by providing the required mobility features in cells other than those where alterations are originally planned, provided that each such cell:

1. Is located within the same prison site;
2. Is integrated with other cells to the maximum extent feasible;
3. Has equal physical access as the altered cells to areas used by inmates or detainees for visitation, dining, recreation, educational programs, medical services, work programs, religious services, and participation in other programs that the facility offers to inmates or detainees; and,

**Exception No. 2:** If it is technically infeasible to comply with 12.32.2.1.3.1, 12.32.2.1.3.2 and 12.32.2.1.3.2 within the same prison site, a substitute cell must be provided at another prison site within the corrections system.

12.32.2.1.3.3

Health care Occupancies and Residential Board and Care Occupancies within jails, prisons, and other detention and corrections facilities of public entities shall comply with Section 12.23.

[2010 ADA STANDARDS (DOJ): 232.1]

12.32.2.2

Beds.

In cells having more than 25 beds, at least 5 percent of the beds shall have clear floor space complying with ICC/ANSI A117.1, Section 806.3. [2010 ADA STANDARDS (DOJ): 232.2.1.1]

12.32.2.3

Cells with Communication Features.

At least 2 percent, but no fewer than one, of the total number of general holding cells and general housing cells equipped with audible emergency alarm systems and permanently installed telephones within the cell shall provide communication features complying with 12.45.2.3. [2010 ADA STANDARDS (DOJ): 232.2.2]

12.32.3

Special Holding Cells and Special Housing Cells.

Where special holding cells or special housing cells are provided, at least one cell serving each purpose shall provide mobility features complying with 12.45.4.2. Cells subject to this requirement include, but are not limited to, those used for purposes of orientation, protective custody, administrative or disciplinary detention or segregation, detoxification, and medical isolation. [2010 ADA STANDARDS (DOJ): 232.3]

**Exception:** Alterations to cells shall not be required to comply except to the extent determined by the Attorney General. [2010 ADA STANDARDS (DOJ): 232.3, Exception]

12.32.4

Medical Care Facilities.

Patient bedrooms or cells required to comply with Section 12.23 shall be provided in addition to any medical isolation cells required to comply with 12.32.3. [2010 ADA STANDARDS (DOJ): 232.4]

12.32.5

Visiting Areas.
Visiting areas shall comply with 12.32.5. [2010 ADA STANDARDS (DOJ): 232.5]

12.32.5.1 Cubicles and Counters.

At least 5 percent, but no fewer than one, of cubicles shall comply with ICC/ANSI A117.1, Section 902 on both the visitor and detainee sides. Where counters are provided, at least one shall comply with ICC/ANSI A117.1, Section 904.3.2 on both the visitor and detainee or inmate sides. [2010 ADA STANDARDS (DOJ): 232.5.1]

Exception: The inmate or detainee side of cubicles or counters at non-contact visiting areas not serving holding cells or housing cells required to comply with Section 12.32 shall not be required to comply with ICC/ANSI A117.1, Section 902 or 904.3.2. [2010 ADA STANDARDS (DOJ): 232.5.1, Exception]

12.32.5.2 Partitions.

Where solid partitions or security glazing separate, visitors from detainees or inmates, at least one of each type of cubicle or counter partition shall comply with ICC/ANSI A117.1, Section 904.6. [2010 ADA STANDARDS (DOJ): 232.5.2]

12.33 Residential Facilities.

12.33.1 General.

12.33.1.1 Residential dwelling units in lodging or rooming house and apartment building occupancies shall comply with Section 12.33. [2010 ADA STANDARDS (DOJ): 233.1]

12.33.1.2 One- and two-family dwelling units shall comply with Section 12.33. [2010 ADA STANDARDS (DOJ): 233.1.2]

For new one- and two-family dwellings, a minimum of one entrance for each dwelling unit shall comply with ICC/ANSI A117.1, Section 1005, requirements for Type C dwellings.

12.33.2 Minimum Number.

Facilities with greater than four residential dwelling units shall comply with 12.33.2. [2010 ADA STANDARDS (DOJ): 233.2]

12.33.2.1 Residential Dwelling Units with Mobility Features.

In facilities with residential dwelling units, at least 5 percent, but no fewer than one unit, of the total number of residential dwelling units shall provide mobility features complying with 12.45.5.2 through 12.45.5.5 and shall be on an accessible route as required by Section 12.6. [2010 ADA STANDARDS (DOJ): 233.2.1]

12.33.2.2 Residential Dwelling Units with Communication Features.

In facilities with residential dwelling units, at least 2 percent, but no fewer than one unit, of the total number of residential dwelling units shall provide communication features complying with 12.45.5.6. [2010 ADA STANDARDS (DOJ): 233.2.2]
12.33.2.3 Additions.

Where an addition to an existing building results in an increase in the number of residential dwelling units, the requirements of 12.33.2 shall apply only to the residential dwelling units that are added until the total number of residential dwelling units complies with the minimum number required by. 12.33.2. Residential dwelling units required to comply with 12.33.2.1 shall be on an accessible route as required by Section 12.6 [2010 ADA STANDARDS (DOJ): 233.3.3]

12.33.2.4 Alterations.

Alterations shall comply with 12.33.2.4 [2010 ADA STANDARDS (DOJ): 233.3.4]

Exception: Where compliance with 12.45.5.3 - 12.45.5.4 - or 12.45.5.5 is technically infeasible, or where it is technically infeasible to provide an accessible route to a residential dwelling unit, the entity shall be permitted to alter or construct a comparable residential dwelling unit to comply with 12.45.5.2 through 12.45.5.5 - provided that the minimum number of residential dwelling units required by 12.33.2.1 and 12.33.2.2, as applicable, is satisfied. [2010 ADA STANDARDS (DOJ): 233.3.4, Exception]

12.33.2.4.1 Alterations to Vacated Buildings.

Where a building is vacated for the purposes of alteration, and the altered building contains more than 15 residential dwelling units, at least 5 percent of the residential dwelling units shall comply with 12.45.5.2 through 12.45.5.5 and shall be on an accessible route as required by Section 12.6. In addition, at least 2 percent of the residential dwelling units shall comply with 12.45.5.6 [2010 ADA STANDARDS (DOJ): 233.3.4.1]

12.33.2.4.2 Alterations to Individual Residential Dwelling Units.

In individual residential dwelling units, where a bathroom or a kitchen is substantially altered, and at least one other room is altered, the requirements of 12.33.2 shall apply to the altered residential dwelling units until the total number of residential dwelling units complies with the minimum number required by 12.33.2.1 and 12.33.2.2. Residential dwelling units required to comply with 12.33.2.1 shall be on an accessible route as required by Section 12.6 [2010 ADA STANDARDS (DOJ): 233.3.4.2]

Exception: Where facilities contain 15 or fewer residential dwelling units, the requirements of 12.33.2.1 and 12.33.2.2 shall apply to the total number of residential dwelling units that are altered under a single contract or are developed as a whole, whether or not located on a common site. [2010 ADA STANDARDS (DOJ): 233.3.4.2, Exception]

12.33.2.5 Dispersion.

12.33.2.5.1 Residential dwelling units required to provide mobility features complying with 12.45.5.2 through 12.45.5.5 and residential dwelling units required to provide communication features complying with 12.45.5.6 shall be dispersed among the various types of residential dwelling units in the facility and shall provide choices of residential dwelling units comparable to and integrated with those available to other residents. [2010 ADA STANDARDS (DOJ): 233.3.5]
12.33.2.5.2 –
Group homes, halfway houses, shelters, or similar social service center establishments shall comply with 12.33 and the following:

(1) - In sleeping rooms with more than 25 beds, a minimum of 5% of the beds shall have clear floor space complying with 806.2.3 of ICC/ANSI A117.1.

(2) - Facilities with more than 50 beds that provide common use bathing facilities shall:

(3) - Provide at least one roll-in shower with a seat that complies with 608 of ICC/ANSI A117.1.

(4) - Provide at least one roll-in shower for each group when separate shower facilities are provided for men and for women.

(5) - Transfer-type showers are not permitted in lieu of a roll-in shower with a seat. The exceptions in 608.3 and 608.4 of ICC/ANSI A117.1 for residential dwelling units are not permitted.

12.33.3 – Residential Dwelling Units with Usable Features.
In facilities with residential dwelling units, all units that are not required to comply with 12.45.5.2 through 12.45.5.5 shall comply with ICC/ANSI 117.1, Section 1004 (Type B Units), and shall be on an accessible route as required by Section 12.6.

12.33.3.1 – Alternative Unit Design.
The requirements of ICC/ANSI 117.1, Section 1003 (Type A units), shall be permitted to be used in lieu of Type B requirements.

12.33.3.2 – Reduction in the Number of Type B Units.
The number of Type B units shall be permitted to be reduced according to 12.33.3.2.

12.33.3.2.1 – Ground Floor Units Accessed by Elevator.
Where an elevator is provided only as a means of creating an accessible route to sleeping units on a ground floor, the building shall not be considered an elevator building for purposes of this chapter. Only the units that are located on stories listed in 12.33.3.2.2 and 12.33.3.2.3 shall be required to be Type B units.

12.33.3.2.2 – Non-Elevator Buildings.

12.33.3.2.2.1 – Ground Floor Units.
The term ground floor shall mean a floor of a building with a building entrance on an accessible route. A building shall be permitted to have one or more ground floors. Sleeping units within a single structure separated by fire walls shall not constitute separate buildings.

12.33.3.2.2.2 –
Where the first floor containing sleeping units in a building is above grade, all units on that floor shall be served by a building entrance on an accessible route. This floor shall be considered to be a ground floor.

12.33.3.2.2.3 –
All units on the story(s) specified in 12.33.3.2.2.2 shall be Type B units.

12.33.3.2.3 – Units on Stories Other Than Ground Floor.
Units in buildings without elevators shall be required to be Type B on all stories that have an entrance near arrival points that serve sleeping accommodations on that story if both of the following apply: The slopes of the undisturbed site measured between the entrance and all vehicular or pedestrian arrival points within 50 ft (15 m) of the entrance do not exceed 10 percent.

The slopes of the finished grade measured between the entrance and all vehicular or pedestrian arrival points within 50 ft (15 m) of the entrance also do not exceed 10 percent.

12.33.3.2.3.1

If there are no vehicular or pedestrian arrival points within 50 ft (15 m) of the planned entrance, the slope shall be measured to the closest vehicular or pedestrian arrival point.

12.33.3.2.3.2

In a multistory dwelling unit with elevator service to any of its floors, one floor that has elevator service shall be the primary entry to the unit, that same floor of the unit shall comply with the requirements for a Type B unit, and a Type B toilet room shall be provided on that floor.

12.33.3.2.4 Site Impracticality.

Units shall not be required to be Type B when it is impractical to provide an accessible entrance served by an accessible route to the building due to site constraints.

12.33.3.2.4.1 Individual Building Test.

It shall be considered impractical to provide an accessible entrance served by an accessible route when the terrain of the site with a single building having a common entrance for all units is as follows:

1. The slopes of the undisturbed site measured between the planned entrance and all vehicular or pedestrian arrival points within 50 ft (15 m) of the planned entrance exceed 10 percent.

2. The slopes of the planned finished grade measured between the entrance and all vehicular or pedestrian arrival points within 50 ft (15 m) of the planned entrance also exceed 10 percent.

12.33.3.2.4.2

If there are no vehicular or pedestrian arrival points within 50 ft (15 m) of the planned entrance, the slope, for the purposes of this section, shall be measured to the closest vehicular or pedestrian arrival point.
12.33.2.4.3 - Site Analysis Test.

For a site having multiple buildings, or a site with a single building with multiple entrances, the impracticality of providing an accessible entrance served by an accessible route shall be established by the following steps:

1. The percentage of the total buildable area of the undisturbed site, with a natural grade less than 10 percent slope, shall be calculated and the following criteria also shall be met:

   2. The analysis of the existing slope (before grading) shall be done on a topographic survey with 24 in. (610 mm) contour intervals, with slope determination made between each successive interval.

   3. The accuracy of the slope analysis shall be certified by a professional licensed engineer, landscape architect, architect, or surveyor.

   4. To determine the practicality of providing accessibility to planned multifamily dwellings based on the topography of the existing natural terrain, the minimum percentage of ground floor units to be made accessible shall equal the percentage of the total buildable area (excluding floodplains, wetlands, or other restricted use areas) of the undisturbed site that has an existing natural grade of less than 10 percent slope.

   5. In addition to the percentage established in 12.33.2.4.3 - (1), all ground floor units in a building or ground floor units served by a particular entrance shall be made accessible if the entrance to the units is on an accessible route, defined as a walkway with a slope between the planned entrance and a pedestrian or vehicular arrival point not greater than 8.33 percent.

12.33.2.4.4 - Site Impracticality Due to Unusual Characteristics.

Unusual characteristics shall include sites located in a federally designated floodplain or coastal high hazard area and sites subject to other similar requirements of law or code that the lowest floor or the lowest structural member of the lowest floor must be raised to a specified level at or above the base flood elevation.

(A) -

An accessible route to a building entrance shall be considered impractical due to unusual characteristics of the site when one of the following applies:

1. The unusual site characteristics result in a difference in finished grade elevation exceeding 30 in. (760 mm) and 10 percent, measured between an entrance and all vehicular or pedestrian arrival points within 50 ft (15 m) of the planned entrance.

2. If there are no vehicular or pedestrian arrival points within 50 ft (15 m) of the planned entrance, the unusual characteristics result in a difference in finished grade elevation exceeding 30 in. (760 mm) and 10 percent, measured between an entrance and the closest vehicular or pedestrian arrival point.
Regardless of site considerations described in 12.33.3.2.4.4 (1) and (2), an accessible entrance on an accessible route shall be practical when one of the following applies:

(1) - There is an elevator connecting the parking area with the dwelling units on a ground floor, and the following also apply:

(2) - Where a building elevator is provided only as a means of creating an accessible route to dwelling units on a ground floor, the building is not considered an elevator building for purposes of these guidelines, and only the ground floor dwelling units are covered.

(3) - If the building elevator is provided as a means of access to dwelling units other than dwelling units on a ground floor, the building is an elevator building that is a covered multifamily dwelling, and the elevator in the building must provide accessibility to all dwelling units in the building, regardless of the slope of the natural terrain.

(4) - An elevated walkway is planned between a building entrance and a vehicular or pedestrian arrival point, and the planned walkway has a slope not greater than 10 percent.

12.33.3.2.4.5 -

At least 20 percent of the total ground floor units in non-elevator buildings, on any site, shall be Type B units.

12.33.3.2.5 - Base Flood Elevation.

12.33.3.2.5.1 -

Accessible entrances on accessible routes shall not be required for a building where the lowest floor or the lowest structural floor member of a non-elevator building is required to be raised above existing grade to or above the base flood elevation, and the following also apply:

(1) - The difference in elevation between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 ft (15 m) exceeds 30 in. (760 mm).

(2) - The slope between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 ft (15 m) exceeds 10 percent.

12.33.3.2.5.2 -

Where no such arrival points are within 50 ft (15 mm) of the primary entrances, the closest arrival point shall be used.

12.34 - Amusement Rides.

[2010 ADA STANDARDS (DOJ): 234]

12.34.1 * - General.

Amusement rides shall comply with Section 12.34. [2010 ADA STANDARDS (DOJ): 234.1]
Amusement rides shall provide at least one wheelchair space complying with 12.45.8.2.4, or at least one amusement ride seat designed for transfer complying with 12.45.8.2.5, or at least one transfer device complying with 12.45.8.2.6. [2010 ADA STANDARDS (DOJ): 234.3]

Where existing amusement rides are altered, the alteration shall comply with 12.34.3. [2010 ADA STANDARDS (DOJ): 234.4]

Where the structural or operational characteristics of an amusement ride are altered to the extent that the amusement ride's performance differs from that specified by the manufacturer or the original design, the amusement ride shall comply with 1102.3 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 234.4.2]

Boat slips complying with 1103 of ICC/ANSI A117 shall be provided in accordance with Table 12.35.1. Where the number of boat slips is not identified, each 40 ft (12 m) of boat slip edge provided along the perimeter of the pier shall be counted as one boat slip for the purpose of Section 12.35. [2010 ADA STANDARDS (DOJ): 235.2]

<table>
<thead>
<tr>
<th>Total Number of Boat Slips Provided in Facility</th>
<th>Minimum Number of Required Accessible Boat Slips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–25</td>
<td>1</td>
</tr>
<tr>
<td>26–50</td>
<td>2</td>
</tr>
<tr>
<td>51–100</td>
<td>3</td>
</tr>
<tr>
<td>101–150</td>
<td>4</td>
</tr>
<tr>
<td>151–300</td>
<td>5</td>
</tr>
<tr>
<td>301–400</td>
<td>6</td>
</tr>
<tr>
<td>401–500</td>
<td>7</td>
</tr>
<tr>
<td>501–600</td>
<td>8</td>
</tr>
<tr>
<td>601–700</td>
<td>9</td>
</tr>
<tr>
<td>701–800</td>
<td>10</td>
</tr>
<tr>
<td>plus 1 for every 100, or fraction thereof, &gt;1000</td>
<td></td>
</tr>
</tbody>
</table>

Boat slips complying with 1103 of ICC/ANSI A117 shall be dispersed throughout the various types of boat slips provided. Where the minimum number of boat slips required to comply with 12.45.9 has been met, no further dispersion shall be required. [2010 ADA STANDARDS (DOJ): 235.2.1]

Boarding piers at boat launch ramps shall comply with 1103.2 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 235.3]

Exercise machines and equipment shall comply with 1104 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 236.2]
12.38 - Golf Facilities.

12.38.1 - General.

Golf facilities shall comply with 1105 of ICC/ANSI A117.1.

12.38.1.1 - Teeing Grounds.

Where one teeing ground is provided for a hole, the teeing ground shall be designed and constructed so that a golf car can enter and exit the teeing ground. Where two teeing grounds are provided for a hole, the forward teeing ground shall be designed and constructed so that a golf car can enter and exit the teeing ground. Where three or more teeing grounds are provided for a hole, at least two teeing grounds, including the forward teeing ground, shall be designed and constructed so that a golf car can enter and exit each teeing ground. [2010 ADA STANDARDS (DOJ): 238.2.1]

Exception: In existing golf courses, the forward teeing ground shall not be required to be one of the teeing grounds on a hole designed and constructed so that a golf car can enter and exit the teeing ground where compliance is not feasible due to terrain. [2010 ADA STANDARDS (DOJ): 238.2.1, Exception]

12.38.1.2 - Putting Greens.

Putting greens shall be designed and constructed so that a golf car can enter and exit the putting green. [2010 ADA STANDARDS (DOJ): 238.2.2]

12.38.1.3 - Weather Shelters.

Where provided, weather shelters shall be designed and constructed so that a golf car can enter and exit the weather shelter and shall comply with 12.45.12.4. [2010 ADA STANDARDS (DOJ): 238.2.3]

12.38.2 - Practice Putting Greens, Practice Teeing Grounds, and Teeing Stations at Driving Ranges.

At least 5 percent, but no fewer than one, of practice putting greens, practice teeing grounds, and teeing stations at driving ranges shall be designed and constructed so that a golf car can enter and exit the practice putting greens, practice teeing grounds, and teeing stations at driving ranges. [2010 ADA STANDARDS (DOJ): 238.3]


Miniature golf facilities shall comply with Section 1107 of ICC/ANSI A117.1.

12.39.2 - Minimum Number.

At least 50 percent of holes on miniature golf courses shall comply with 1107 of ICC/ANSI A117.1. [2010 ADA STANDARDS (DOJ): 239]
12.39.3 * -- Miniature Golf Course Configuration.

Miniature golf courses shall be configured so that the holes complying with 1107 of ICC/ANSI A117.1 are consecutive. Miniature golf courses shall provide an accessible route from the last hole complying with 1107 of ICC/ANSI A117.1 to the course entrance or exit without requiring travel through any other holes on the course. [2010 ADA STANDARDS (DOJ): 239.3]

Exception: One break in the sequence of consecutive holes shall be permitted provided that the last hole on the miniature golf course is the last hole in the sequence. [2010 ADA STANDARDS (DOJ): 239.3, Exception]

12.40 * -- Play Areas.

[2010 ADA STANDARDS (DOJ): 240] Play areas for children ages 2 and over shall comply with Section 12.40. Where separate play areas are provided within a site for specific age groups, each play area shall comply with Section 1108 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.1]

Exception No. 1: Play areas located in family child care facilities where the proprietor actually resides shall not be required to comply with Section 1108 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.1, Exception 1]

Exception No. 2: In existing play areas, where play components are relocated for the purposes of creating safe use zones and the ground surface is not altered or extended for more than one use zone, the play area shall not be required to comply with Section 1108 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.1, Exception 2]

Exception No. 3: Amusement attractions shall not be required to comply with Section 1108 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.1, Exception 3]

Exception No. 4: Where play components are altered and the ground surface is not altered, the ground surface shall not be required to comply with 1108.2.1 of ICC/ANSI A117 unless required by 42.2.4. [2010 ADA STANDARDS (DOJ): 240.1, Exception 4]

12.40.1 * -- Additions.

Where play areas are designed and constructed in phases, the requirements of Section 12.40 shall apply to each successive addition so that when the addition is completed, the entire play area complies with all the applicable requirements of Section 1108.2.1 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.1.1]

12.40.2 * -- Play Components.

Where provided, play components shall comply with 1108.3.2 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.2]

12.40.2.1 * -- Ground Level Play Components.

Ground level play components shall be provided in the number and types required by 12.40. Where ground level play components that are provided to comply with 12.40.2.1.1 shall be permitted to satisfy the additional number required by 12.40.2.1.2 if the minimum required types of play components are satisfied. Where two or more required ground level play components are provided, they shall be dispersed throughout the play area and integrated with other play components. [2010 ADA STANDARDS (DOJ): 240.2.1]

12.40.2.1.1 -- Minimum Number and Types.

Where ground level play components are provided, at least one of each type shall be on an accessible route and shall comply with 1108.4 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.2.1.1]

12.40.2.1.2 -- Additional Number and Types.

Where elevated play components are provided, ground level play components shall be provided in accordance with Table 12.40.2.1.2 and shall comply with 1108.3.2 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 240.2.1.2]
ADA STANDARDS (DOJ): 240.2.1.2

Table 12.40.2.1.2 Number and Types of Ground Level Play Components Required to Be on Accessible Routes

<table>
<thead>
<tr>
<th>Number of Elevated Play Components Provided</th>
<th>Minimum Number of Ground Level Play Components Required to Be on an Accessible Route</th>
<th>Minimum Number of Different Types of Ground Level Play Components Required to Be on an Accessible Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5–7</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8–10</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>11–13</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>14–16</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>17–19</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>≥26</td>
<td>8, plus 1 for each additional 3, or fraction thereof, ≥25</td>
<td></td>
</tr>
</tbody>
</table>

NA: Not applicable.

Exception: If at least 50 percent of the elevated play components are connected by a ramp and at least three of the elevated play components connected by the ramp are different types of play components, the play area shall not be required to comply with 1108.3.2 of ICC/ANSI A117.

12.40.2.2 * Elevated Play Components.

Where elevated play components are provided, at least 50 percent shall be on an accessible route and shall comply with 1108.3.2.2 of ICC/ANSI A117.

12.41 – Saunas and Steam Rooms.

Exception: Where saunas or steam rooms are clustered at a single location, no more than 5 percent of the saunas and steam rooms, but no fewer than one, of each type in each cluster shall be required to comply with Section 12.41.

12.41.1 – General.

Where provided, saunas and steam rooms shall comply with Section 12.41.

Exception: Where saunas or steam rooms are clustered at a single location, no more than 5 percent of the saunas and steam rooms, but no fewer than one, of each type in each cluster shall be required to comply with Section 12.41.

12.41.2 – Bench.

Where seating is provided in saunas and steam rooms, at least one bench shall comply with ICC/ANSI A117.1, Section 903. Doors shall not swing into the clear floor space required by ICC/ANSI A117.1, Section 903.2.

Exception: A readily removable bench shall be permitted to obstruct the turning space required by 12.41.3 and the clear floor or ground space required by ICC/ANSI A117.1, Section 903.2.

12.41.3 – Turning Space.

A turning space complying with ICC/ANSI A117.1, Section 304 shall be provided within saunas and steam rooms.


Exception: A readily removable bench shall be permitted to obstruct the turning space required by 12.41.3 and the clear floor or ground space required by ICC/ANSI A117.1, Section 903.2.

12.42.1 – General.

Swimming pools, wading pools, and spas shall comply with Section 12.42.
12.43 - Shooting Facilities with Firing Positions.

[2010 ADA STANDARDS (DOJ): 243] Where shooting facilities with firing positions are designed and constructed at a site, at least 5 percent, but no fewer than one, of each type of firing position shall comply with 110 of ICC/ANSI A117. [2010 ADA STANDARDS (DOJ): 243.1]

12.44 - Technical Requirements.

12.44.1 - General.

Buildings and facilities that are required to be accessible shall comply with the requirements of ICC/ANSI A117.1.

12.45 - Additional Technical Requirements.

The technical requirements of Section 12.45 shall apply in addition to the requirements of ICC/ANSI A117.1.

12.45.1 - Break Out Opening in Doors, Doorways, and Gates in Accessible Routes.

Where doors and gates without standby power are a part of a means of egress, the clear break out opening at swinging or sliding doors and gates shall be 32 in. (815 mm) minimum when operated in emergency mode. [2010 ADA STANDARDS (DOJ): 404.3.6]

12.45.2 - Health Care Occupancies.

[2010 ADA STANDARDS (DOJ): 805]

12.45.2.1 - General.

Health care occupancy patient or resident sleeping rooms required to provide mobility features shall comply with 12.45.2. [2010 ADA STANDARDS (DOJ): 805.1]

12.45.2.2 - Turning Space.

Turning space complying with ICC/ANSI A117.1, Section 304 shall be provided within the room. [2010 ADA STANDARDS (DOJ): 805.2]

12.45.2.3 - Clear Floor or Ground Space.

A clear floor space complying with ICC/ANSI A117.1, Section 305 shall be provided on each side of the bed. The clear floor space shall be positioned for parallel approach to the side of the bed. [2010 ADA STANDARDS (DOJ): 805.3]

12.45.2.4 - Toilet and Bathing Rooms.

Toilet and bathing rooms that are provided as part of a patient or resident sleeping room shall comply with ICC/ANSI A117.1, Section 603. Where provided, no fewer than one water closet, one lavatory, and one bathtub or shower shall comply with the applicable requirements of ICC/ANSI A117.1, Section 603 through 610. [2010 ADA STANDARDS (DOJ): 805.4]

12.45.3 - Hotel and Motel Guest Rooms.

[2010 ADA STANDARDS (DOJ): 806]

12.45.3.1 - General.

Transient lodging guest rooms shall comply with 12.45.3. Guest rooms required to provide mobility features shall comply with 12.45.3.2. Guest rooms required to provide communication features shall comply with 12.45.3.3. [2010 ADA STANDARDS (DOJ): 806.1]

12.45.3.2 - Guest Rooms with Mobility Features.

Guest rooms required to provide mobility features shall comply with 12.45.3.2. [2010 ADA STANDARDS (DOJ): 806.2]
12.45.3.2.1 - Living and Dining Areas.
Living and dining areas shall be accessible. [2010 ADA STANDARDS (DOJ): 806.2.1]

12.45.3.2.2 - Exterior Spaces.
Exterior spaces, including patios, terraces, and balconies, that serve the guest room shall be accessible. [2010 ADA STANDARDS (DOJ): 806.2.2]

12.45.3.2.3 - Sleeping Areas.
At least one sleeping area shall provide a clear floor space complying with ICC/ANSI A117.1, Section 305 on both sides of a bed. The clear floor space shall be positioned for parallel approach to the side of the bed. [2010 ADA STANDARDS (DOJ): 806.2.3]

Exception: Where a single clear floor space complying with ICC/ANSI A117.1, Section 305 positioned for parallel approach is provided between two beds, a clear floor or ground space shall not be required on both sides of a bed. [2010 ADA STANDARDS (DOJ): 806.2.3, Exception]

12.45.3.2.4 - Toilet and Bathing Facilities.
No fewer than one water closet, one lavatory, and one bathtub or shower shall comply with ICC/ANSI A117.1, Section 603. In addition, required roll-in shower compartments shall comply with ICC/ANSI A117.1, Section 608.2.2 or 608.2.3. [2010 ADA STANDARDS (DOJ): 806.2.4]

12.45.3.2.5 - Vanity Counter Top Space.
If vanity counter top space is provided in non-accessible guest toilet or bathing rooms, comparable vanity counter top space, in terms of size and proximity to the lavatory, shall also be provided in accessible guest toilet or bathing rooms. [2010 ADA STANDARDS (DOJ): 806.2.4.1]

12.45.3.2.6 - Kitchens and Kitchenettes.
Kitchens and kitchenettes shall comply with ICC/ANSI A117.1, Section 804. [2010 ADA STANDARDS (DOJ): 806.2.5]

12.45.3.2.7 - Turning Space.
Turning space complying with ICC/ANSI A117.1, Section 304 shall be provided within the guest room. [2010 ADA STANDARDS (DOJ): 806.2.6]

12.45.3.3 - Guest Rooms with Communication Features.
Guest rooms required to provide communication features shall comply with ICC/ANSI A117.1, Section 806.3. [2010 ADA STANDARDS (DOJ): 806.3]

12.45.3.3.1 - Alarms.
Where emergency warning systems are provided, alarms complying with NFPA 72 shall be provided. [2010 ADA STANDARDS (DOJ): 806.3.1]

12.45.3.3.2 - Notification Devices.
Visible notification devices shall be provided to alert room occupants of incoming telephone calls and a door knock or bell. Notification devices shall not be connected to visible alarm signal appliances. Telephones shall have volume controls compatible with the telephone system and shall comply with ICC/ANSI A117.1, Section 704.3. Telephones shall be served by an electrical outlet complying with ICC/ANSI A117.1, Section 309, located within 48 in. (1220 mm) of the telephone to facilitate the use of a TTY. [2010 ADA STANDARDS (DOJ): 806.3.2]
12.45.3.4 - Break Out Opening.

Where doors and gates without standby power are a part of a means of egress, the clear break out opening at swinging or sliding doors and gates shall be 32 in. (815 mm) minimum when operated in emergency mode. \[2010 ADA STANDARDS (DOJ): 404.3.6\]

Exception: Where manual swinging doors and gates comply with ICC/ANSI A117.1, Section 404.2 and serve the same means of egress, compliance with 12.45.3.4 shall not be required. \[2010 ADA STANDARDS (DOJ): 404.3.6, Exception\]

12.45.4 - Holding Cells and Housing Cells.

\[2010 ADA STANDARDS (DOJ): 807\]

12.45.4.1 - General.

Holding cells and housing cells shall comply with 12.45.4. \[2010 ADA STANDARDS (DOJ): 807.1\]

12.45.4.2 - Cells with Mobility Features.

Cells required to provide mobility features shall comply with 12.45.4.2. \[2010 ADA STANDARDS (DOJ): 807.2\]

12.45.4.2.1 - Turning Space.

Turning space complying with ICC/ANSI A117.1, Section 304 shall be provided within the cell. \[2010 ADA STANDARDS (DOJ): 807.2.1\]

12.45.4.2.2 - Benches.

Where benches are provided, at least one bench shall comply with ICC/ANSI A117.1, Section 903. \[2010 ADA STANDARDS (DOJ): 807.2.2\]

12.45.4.2.3 - Toilet and Bathing Facilities.

Toilet facilities or bathing facilities that are provided as part of a cell shall comply with ICC/ANSI A117.1, Section 603. Where provided, no fewer than one water closet, one lavatory, and one bathtub or shower shall comply with the applicable requirements of ICC/ANSI A117.1, Section 603 through 610. \[2010 ADA STANDARDS (DOJ): 807.2.4\]

12.45.5 - Residential Dwelling Units.

\[2010 ADA STANDARDS (DOJ): 809\]

12.45.5.1 - General.

Residential dwelling units shall comply with 12.45.5. \[2010 ADA STANDARDS (DOJ): 809.1\]

12.45.5.2 - Communication Features.

Residential dwelling units required to provide communication features shall comply with 12.45.5.6. \[2010 ADA STANDARDS (DOJ): 809.5\]

12.45.5.3 - Accessible Routes.

Accessible routes complying with ICC/ANSI A117.1, 4 shall be provided within residential dwelling units in accordance with 12.45.5.3. \[2010 ADA STANDARDS (DOJ): 809.2\]

Exception: Accessible routes shall not be required to or within unfinished attics or unfinished basements. \[ADA/ABA-AG: 809.2, Exception\]

12.45.5.3.1 - Location.

At least one accessible route shall connect all spaces and elements which are a part of the residential dwelling unit. Where only one accessible route is provided, it shall not pass through bathrooms, closets, or similar spaces. \[2010 ADA STANDARDS (DOJ): 809.2.1\]
12.45.5.3.2 * - Turning Space.

All rooms served by an accessible route shall provide a turning space complying with ICC/ANSI A117.1, Section 304. [2010 ADA STANDARDS (DOJ): 809.2.2]

Exception: Turning space shall not be required in exterior spaces 30 in. (760 mm) maximum in depth or width. [2010 ADA STANDARDS (DOJ): 809.2.2, Exception]

12.45.5.4 - Kitchen.

Where a kitchen is provided, it shall comply with ICC/ANSI A117.1, Section 804. [2010 ADA STANDARDS (DOJ): 809.3]

12.45.5.5 * - Toilet Facilities and Bathing Facilities.

At least one toilet facility and bathing facility shall comply with ICC/ANSI A117.1, Section 603 through 610. At least one of each type of fixture provided shall comply with applicable requirements of ICC/ANSI A117.1, Section 603 through 610. Toilet and bathing fixtures required to comply with ICC/ANSI A117.1, Section 603 through 610 shall be located in the same toilet and bathing area, such that travel between fixtures does not require travel between other parts of the residential dwelling unit. [2010 ADA STANDARDS (DOJ): 809.4]

12.45.5.6 - Residential Dwelling Units with Communication Features.

Residential dwelling units required to provide communication features shall comply with 12.45.5.6. [2010 ADA STANDARDS (DOJ): 809.5]

12.45.5.6.1 - Building Fire Alarm System.

Where a building fire alarm system is provided, the system wiring shall be extended to a point within the residential dwelling unit in the vicinity of the residential dwelling unit smoke detection system. [2010 ADA STANDARDS (DOJ): 809.5.1]

12.45.5.6.1.1 - Alarm Appliances.

Where alarm appliances are provided within a residential dwelling unit as part of the building fire alarm system, they shall comply with NFPA 72. [2010 ADA STANDARDS (DOJ): 809.5.1.1]

12.45.5.6.1.2 - Activation.

All visible alarm appliances provided within the residential dwelling unit for building fire alarm notification shall be activated upon activation of the building fire alarm in the portion of the building containing the residential dwelling unit. [2010 ADA STANDARDS (DOJ): 809.5.1.2]

12.45.5.6.2 - Residential Dwelling Unit Smoke Detection System.

12.45.5.6.2.1 - Residential dwelling unit smoke detection systems shall comply with NFPA 72. [2010 ADA STANDARDS (DOJ): 809.5.2]

12.45.5.6.2.2 - Activation.

All visible alarm appliances provided within the residential dwelling unit for smoke detection notification shall be activated upon smoke detection. [2010 ADA STANDARDS (DOJ): 809.5.2.2]

12.45.5.6.3 - Interconnection.

The same visible alarm appliances shall be permitted to provide notification of residential dwelling unit smoke detection and building fire alarm activation. [2010 ADA STANDARDS (DOJ): 809.5.3]
12.45.5.6.4 - Prohibited Use.
Visible alarm appliances used to indicate residential dwelling unit smoke detection or building fire alarm activation shall not be used for any other purpose within the residential dwelling unit. [2010 ADA STANDARDS (DOJ): 809.5.4]

12.45.5.6.5 - Residential Dwelling Unit Primary Entrance.
Communication features shall be provided at the residential dwelling unit primary entrance complying with 12.45.5.6.5. [2010 ADA STANDARDS (DOJ): 809.5.5]

12.45.5.6.5.1 - Notification.
A hard-wired electric doorbell shall be provided. A button or switch shall be provided outside the residential dwelling unit primary entrance. Activation of the button or switch shall initiate an audible tone and visible signal within the residential dwelling unit. Where visible doorbell signals are located in sleeping areas, they shall have controls to deactivate the signal. [2010 ADA STANDARDS (DOJ): 809.5.5.1]

12.45.5.6.5.2 - Identification.
A means for visually identifying a visitor without opening the residential dwelling unit entry door shall be provided and shall allow for a minimum 180 degree range of view. [2010 ADA STANDARDS (DOJ): 809.5.5.2]

12.45.5.6.6 - Site, Building, or Floor Entrance.
Where a system, including a closed-circuit system, permitting voice communication between a visitor and the occupant of the residential dwelling unit is provided, the system shall comply with 12.45.5.6.6. [2010 ADA STANDARDS (DOJ): 809.5.6]

12.45.5.6.6.1 - Common Use or Public Use System Interface.
The common use or public use system interface shall include the capability of supporting voice and TTY communication with the residential dwelling unit interface. [2010 ADA STANDARDS (DOJ): 708.4.1]

12.45.5.6.6.2 - Residential Dwelling Unit Interface.
The residential dwelling unit system interface shall include a telephone jack capable of supporting voice and TTY communication with the common use or public use system interface. [2010 ADA STANDARDS (DOJ): 708.4.2]

12.45.6 - Special Rooms, Spaces, and Elements — Transportation Facilities.
Station platforms shall be positioned to coordinate with vehicles in accordance with the applicable requirements of 36 CFR Part 1192. Low-level platforms shall be 8 in. (205 mm) minimum above top of rail. [2010 ADA STANDARDS (DOJ): 810.5.3]

Exception: Where vehicles are boarded from sidewalks or street-level, low-level platforms shall be permitted to be less than 8 in. (205 mm). [2010 ADA STANDARDS (DOJ): 810.5.3, Exception]

12.45.7 - Storage.
[2010 ADA STANDARDS (DOJ): 811]

12.45.7.1 - General.
Storage shall comply with 12.45.7. [2010 ADA STANDARDS (DOJ): 811.1]

12.45.7.2 - Clear Floor or Ground Space.
A clear floor or ground space complying with ICC/ANSI A117.1, Section 305 shall be provided. [2010 ADA STANDARDS (DOJ): 811.2]
12.45.7.3 - Height.
Storage elements shall comply with at least one of the reach ranges specified in ICC/ANSI A117.1, Section 308. [2010 ADA STANDARDS (DOJ): .811.3]

12.45.7.4 - Operable Parts.
Operable parts shall comply with ICC/ANSI A117.1, Section 309. [2010 ADA STANDARDS (DOJ): .811.4]

12.45.8 - Recreational Facilities.

12.45.8.1 - Scope.
The provisions of 12.45.8 shall apply where required by Sections 12.1 through 12.43 of this Code. [2010 ADA STANDARDS (DOJ): .1001.1]

12.45.8.2 - Amusement Rides.
[2010 ADA STANDARDS (DOJ): .1002]

12.45.8.2.1 - General.
Amusement rides shall comply with 12.45.8.2. [2010 ADA STANDARDS (DOJ): .1002.1]

12.45.8.2.2 - Accessible Routes.
Accessible routes serving amusement rides shall comply with ICC/ANSI A117.1, Chapter 4. [2010 ADA STANDARDS (DOJ): .1002.2]

Exception No. 1: In load or unload areas and on amusement rides, where compliance with ICC/ANSI A117.1, Section 405.2 is not structurally or operationally feasible, ramp slope shall be permitted to be 1:8 maximum. [2010 ADA STANDARDS (DOJ): .1002.2, Exception 1]

Exception No. 2: In load or unload areas and on amusement rides, handrails provided along walking surfaces complying with ICC/ANSI A117.1, Section 403 and required on ramps complying with ICC/ANSI A117.1, Section 405 shall not be required to comply with ICC/ANSI A117.1, Section 505 where compliance is not structurally or operationally feasible. [2010 ADA STANDARDS (DOJ): .1002.2, Exception 2]

12.45.8.2.3 - Load and Unload Areas.
A turning space complying with ICC/ANSI A117.1, Section 304.2 and 304.3 shall be provided in load and unload areas. [2010 ADA STANDARDS (DOJ): .1002.3]

12.45.8.2.4 - Wheelchair Spaces in Amusement Rides.
Wheelchair spaces in amusement rides shall comply with 12.45.8.2.4. [2010 ADA STANDARDS (DOJ): .1002.4]

12.45.8.2.4.1 - Floor or Ground Surface.
The floor or ground surface of wheelchair spaces shall be stable and firm. [2010 ADA STANDARDS (DOJ): .1002.4.1]

12.45.8.2.4.2 - Slope.
The floor or ground surface of wheelchair spaces shall have a slope not steeper than 1:48 when in the load and unload position. [2010 ADA STANDARDS (DOJ): .1002.4.2]
12.45.8.2.4.3 – Gaps.
Floors of amusement rides with wheelchair spaces and floors of load and unload areas shall be coordinated so that, when amusement rides are at rest in the load and unload position, the vertical difference between the floors shall be within plus or minus $\frac{5}{8}$ in. (16 mm) and the horizontal gap shall be 3 in. (75 mm) maximum under normal passenger load conditions. [2010 ADA STANDARDS (DOJ): 1002.4.3]

Exception: Where compliance is not operationally or structurally feasible, ramps, bridge plates, or similar devices complying with the applicable requirements of 36 CFR 1192.83(c) shall be provided. [2010 ADA STANDARDS (DOJ): 1002.4.3, Exception]

12.45.8.2.4.4 – Clearances.
Clearances for wheelchair spaces shall comply with 12.45.8.2.4.4. [2010 ADA STANDARDS (DOJ): 1002.4.4]

Exception No. 1: Where provided, securement devices shall be permitted to overlap required clearances. [2010 ADA STANDARDS (DOJ): 1002.4.4, Exception 1]

Exception No. 2: Wheelchair spaces shall be permitted to be mechanically or manually repositioned. [2010 ADA STANDARDS (DOJ): 1002.4.4, Exception 2]

Exception No. 3: Wheelchair spaces shall not be required to comply with ICC/ANSI A117.1, Section 307.4.

12.45.8.2.4.5 – Width and Length.
Wheelchair spaces shall provide a clear width of 30 in. (760 mm) minimum and a clear length of 48 in. (1220 mm) minimum measured to 9 in. (230 mm) minimum above the floor surface. [2010 ADA STANDARDS (DOJ): 1002.4.4, Exception 3]

12.45.8.2.4.6 – Side Entry.
Where wheelchair spaces are entered only from the side, amusement rides shall be designed to permit sufficient maneuvering clearance for individuals using a wheelchair or mobility aid to enter and exit the ride. [2010 ADA STANDARDS (DOJ): 1002.4.4.2]

12.45.8.2.4.7 – Permitted Protrusions in Wheelchair Spaces.
Objects are permitted to protrude a distance of 6 in. (150 mm) maximum along the front of the wheelchair space, where located 9 in. (230 mm) minimum and 27 in. (685 mm) maximum above the floor or ground surface of the wheelchair space. Objects are permitted to protrude a distance of 25 in. (635 mm) maximum along the front of the wheelchair space, where located more than 27 in. (685 mm) above the floor or ground surface of the wheelchair space in accordance with Figure 12.45.8.2.4.7. [2010 ADA STANDARDS (DOJ): 1002.4.4.3]

Figure 12.45.8.2.4.7 – Protrusions in Wheelchair Spaces in Amusement Rides. [ADA/ABA-AG: Figure 1002.4.4.3]
12.45.8.2.4.8 - Ride Entry.

Openings providing entry to wheelchair spaces on amusement rides shall be 32 in. (815 mm) minimum clear. [2010 ADA STANDARDS (DOJ): 1002.4.5]

12.45.8.2.4.9 - Approach.

One side of the wheelchair space shall adjoin an accessible route when in the load and unload position. [2010 ADA STANDARDS (DOJ): 1002.4.6]

12.45.8.2.4.10 - Companion Seats.

Where the interior width of the amusement ride is greater than 53 in. (1345 mm), seating is provided for more than one rider, and the wheelchair is not required to be centered within the amusement ride, a companion seat shall be provided for each wheelchair space. [2010 ADA STANDARDS (DOJ): 1002.4.7]

12.45.8.2.4.11 - Shoulder-to-Shoulder Seating.

Where an amusement ride provides shoulder-to-shoulder seating, companion seats shall be shoulder-to-shoulder with the adjacent wheelchair space. [2010 ADA STANDARDS (DOJ): 1002.4.7.1]

Exception: Where shoulder-to-shoulder companion seating is not operationally or structurally feasible, compliance with this requirement shall be required to the maximum extent practicable. [2010 ADA STANDARDS (DOJ): 1002.4.7.1, Exception]

12.45.8.2.5 - Amusement Ride Seats Designed for Transfer.

Amusement ride seats designed for transfer shall comply with 12.45.8.2.5 when positioned for loading and unloading. [2010 ADA STANDARDS (DOJ): 1002.5]

12.45.8.2.5.1 - Clear Floor or Ground Space.

A clear floor or ground space complying with ICC/ANSI A117.1, Section 305 shall be provided in the load and unload area adjacent to the amusement ride seats designed for transfer. [2010 ADA STANDARDS (DOJ): 1002.5.1]

12.45.8.2.5.2 - Transfer Height.

The height of amusement ride seats designed for transfer shall be 14 in. (355 mm) minimum and 24 in. (610 mm) maximum measured from the surface of the load and unload area. [2010 ADA STANDARDS (DOJ): 1002.5.2]

12.45.8.2.5.3 - Transfer Entry.

Where openings are provided for transfer to amusement ride seats, the openings shall provide clearance for transfer from a wheelchair or mobility aid to the amusement ride seat. [2010 ADA STANDARDS (DOJ): 1002.5.3]

12.45.8.2.5.4 - Wheelchair Storage Space.

Wheelchair storage spaces complying with ICC/ANSI A117.1, Section 305 shall be provided in or adjacent to unload areas for each required amusement ride seat designed for transfer and shall not overlap any required means of egress or accessible route. [2010 ADA STANDARDS (DOJ): 1002.5.4]

12.45.8.2.6 - Transfer Devices for Use with Amusement Rides.

Transfer devices for use with amusement rides shall comply with 12.45.8.2.6 when positioned for loading and unloading. [2010 ADA STANDARDS (DOJ): 1002.6]

12.45.8.2.6.1 - Clear Floor or Ground Space.

A clear floor or ground space complying with ICC/ANSI A117.1, Section 305 shall be provided in the load and unload area adjacent to the transfer device. [2010 ADA STANDARDS (DOJ): 1002.6.1]
12.45.8.2.6.2 - Transfer Height.
The height of transfer device seats shall be 14 in. (355 mm) minimum and 24 in. (610 mm) maximum measured from the load and unload surface. [2010 ADA STANDARDS (DOJ): 1002.6.2]

12.45.8.2.6.3 - Wheelchair Storage Space.
Wheelchair storage spaces complying with ICC/ANSI A117.1, Section 305 shall be provided in or adjacent to unload areas for each required transfer device and shall not overlap any required means of egress or accessible route. [2010 ADA STANDARDS (DOJ): 1002.6.3]

12.45.9 - Recreational Boating Facilities.
[2010 ADA STANDARDS (DOJ): 1003]

12.45.9.1 - General.
Recreational boating facilities shall comply with. [2010 ADA STANDARDS (DOJ): 1003.1]

Statement of Problem and Substantiation for Public Input

This revision deletes all of Chapter 12 and replaces it with "Buildings and facilities and additions to and altered portions of existing buildings and facilities shall be in compliance with ICC/ANSI A117.1." There is no need to reprint portions of the requirements. This follows the format of many of the structural chapters in this code. It is intended that this adopt the 2009 edition, which is the latest, and would be identified as such in Chapter 2.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 17:55:12 EDT 2015

Committee Statement

Resolution: The PI will create confusion and it appears to create more restrictive requirements than are currently in place.
12.33.1.2.3 The criteria of ICC/ANSI A117.1, Section 1005, requirements for Type C dwellings, shall not apply where the only accessible entrance is from the garage or carport and there are no habitable rooms on the garage/carport level.

12.33.1.2.4 The criteria of ICC/ANSI A117.1, Section 1005, requirements for Type C dwellings, shall not apply to building alterations.

Statement of Problem and Substantiation for Public Input

This change and the revised text in 12.33.1.2.2, plus accompanying Annex language, were developed by the NFPA 5000 Site Impracticality Task Group to better address the issue of access to one and two family dwelling units. The intent is to draft language that is easy for a homeowner to determine whether their building must comply and that is not over restrictive. The focus of the Task Group was on the 95% of new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.

Related Public Inputs for This Document

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<td>Site Impracticality Task Group</td>
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<tr>
<td>[Section No. 12.33.1.2.2]</td>
<td>recommendation</td>
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Submitter Information Verification

Submitter Full Name: JOHN RICKARD
Organization: P3 CONSULTING
Affiliation: NFPA 5000 Building Systems Site Impracticality Task Group
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Jul 03 15:11:37 EDT 2015

Committee Statement

12.33.1.2.3 The criteria of ICC/ANSI A117.1, Section 1005, requirements for Type C dwellings, shall not apply to any entrance located on a level with no habitable rooms.

Statement of Problem and Substantiation for Public Input

This input is alternative language to another public input that has been submitted regarding site impracticality. The language being replaced is specific only to carport/garage entrances.

Submitter Information Verification

Submitter Full Name: JAMES RICKARD
Organization: P3 CONSULTING
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 12:25:15 EDT 2015

Committee Statement

12.33.1.2.2
The criteria of ICC/ANSI A117.1, Section 1005, requirements for Type C dwellings, shall not apply where there is site impracticality as determined by 12.33.3.2.4. The vertical change of level at every entrance to the building is greater than 18 inches between the floor level each entrance serves and the final grade of the exterior surface at all points within five feet of that entrance.

Statement of Problem and Substantiation for Public Input

This change and the new text that follows in 12.33.1.2.3 and 12.33.1.2.4, plus accompanying Annex language, were developed by the NFPA 5000 Site Impracticality Task Group to better address the issue of access to one and two family dwelling units. The intent is to draft language that is easy for a homeowner to determine whether their building must comply and that is not over restrictive. The focus of the Task Group was on the 95% of new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.

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<td>Public Input No. 110-NFPA 5000-2015 [New Section after A.12.33.1]</td>
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Submitter Information Verification

Submitter Full Name: JOHN RICKARD
Organization: P3 CONSULTING
Affiliation: NFPA 5000 Building Systems Site Impracticality Task Group
Street Address: 
City: 
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Zip: 
Submittal Date: Fri Jul 03 14:59:11 EDT 2015

Committee Statement

Statement: This change and the new text that follows in 12.33.1.2.3 and 12.33.1.2.4, plus accompanying Annex language, were developed by the Site Impracticality Task Group of the Building Systems technical committee to better address the issue of access to one
and two family dwelling units. The committee's language makes it easier for a homeowner to determine whether their building must comply and it is not overly restrictive. The focus of the Committee is to capture 95% of the new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.

This Annex language and the text to which it refers were developed by the NFPA 5000 Site Impracticality Task Group to better address the issue of access to one and two family dwelling units. The committee finds the language to be easier for a homeowner to determine whether their building must comply and that is not overly restrictive. The committee agrees with the focus of the Task Group to capture 95% of the new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.
### 13.1 General

Sections 13.1.1 through 13.8.7 pertain to structures encroaching or built within a public way apply unless regulated by other laws or ordinances.

#### 13.1.1

No part of any structure or any appendage thereto, except signs, shall project beyond the property lines of the building site, except as specified in Section 13.1. Signs and their method of installation shall conform to the requirements of Chapter 32.

#### 13.1.2

Structures or appendages regulated by this Code shall be constructed of materials as specified in Chapter 35.

#### 13.1.3

The projection of any structure or appendage shall be the distance measured horizontally from the property line to the outermost point of the projection.

#### 13.1.4

No provisions of this chapter shall be construed to permit the violation of other laws or ordinances regulating the use and occupancy of public property.

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### Statement of Problem and Substantiation for Public Input

This adds clarifying language to the beginning of the section, which is a clear statement of intent.

### Submitter Information Verification

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**Organization:** Building Safety Division, Clark County, Washington  
**Affiliation:** NFPA's Building Code Development Committee (BCDC)  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Sat Jul 04 18:01:35 EDT 2015

### Committee Statement

**Resolution:** The proposed revision would not add clarity; it simply moves text.
Public Input No. 210-NFPA 5000-2015 [Sections 15.1.2.2, 15.1.2.3]

Sections 15.1.2.2, 15.1.2.3

15.1.2.2 Equivalent Alternatives.

15.1.2.2.1

Equivalency shall be permitted in accordance with Section 1.5.

15.1.2.2.2*

Where this chapter requires compliance with the seismic design provisions of Chapter 35, the use of FEMA 356, Prestandard and Commentary for the Seismic Rehabilitation of ASCE 41, Seismic Evaluation and Retrofit of Existing Buildings, shall be permitted. Where FEMA 356 is used, the seismic performance criteria shall be as indicated in Table 15.1.2.2.2.2 of ASCE 41, for the assigned occupancy category.

Table 15.1.2.2.2 Seismic Performance Criteria

<table>
<thead>
<tr>
<th>FEMA 356 Performance Levels Occupancy Category (See Table 35.3.1)</th>
<th>BSE-1 Earthquake Hazard Level</th>
<th>BSE-2 Earthquake Hazard Level</th>
<th>I LS CP</th>
<th>II LS CP</th>
<th>III ‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
</tr>
</tbody>
</table>

LS: Life safety.
CP: Collapse prevention.
IO: Immediate occupancy.

† BSE-1 and BSE-2 hazards are defined in FEMA 356.

‡ Values for Occupancy Category III performance levels are to be taken as halfway between the values specified for Occupancy Category II and Occupancy Category IV.

15.1.2.3 Other Alternatives.

15.1.2.3.1

Where compliance with this chapter, or with any other code as required by this chapter, is technically infeasible or would impose undue hardship because of structural, construction, or dimensional difficulties, the authority having jurisdiction shall be permitted to accept other alternative materials, design features, and operational features.
15.1.2.3.2*

Where permitted in this chapter, seismic design using ASCE/SEI 31-41, Seismic Evaluation and Retrofit of Existing Buildings, or FEMA 356 shall be permitted. Where either ASCE/SEI 31 or FEMA 356 are used, the seismic performance criteria shall be as indicated in Table 15.1.2.3.2-1 of ASCE 41 for the assigned occupancy category.

Table 15.1.2.3.2 Reduced Seismic Performance Criteria

<table>
<thead>
<tr>
<th>FEMA 356 Performance Levels Occupancy Category</th>
<th>(See Table 35.3.1)</th>
<th>ASCE/SEI 31 Performance Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSE-1 Earthquake Hazard Level †</td>
<td>BSE-2 Earthquake Hazard Level ‡</td>
<td></td>
</tr>
<tr>
<td>I LS LS NR II LS LS NR III ‡</td>
<td>NR IV IO IO NR</td>
<td></td>
</tr>
<tr>
<td>LS: Life safety.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR: Not required.</td>
<td></td>
<td></td>
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<tr>
<td>IO: Immediate occupancy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>† BSE-1 and BSE-2 hazards are as defined in FEMA 356.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‡ Values for Occupancy Category III performance levels are to be taken as halfway between the values specified for Occupancy Category II and Occupancy Category IV.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Input

ASCE 31 and FEMA 356 have been replaced with ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings. This proposal cleans up the two sections.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 209-NFPA 5000-2015 [Section No. 2.3.7]</td>
<td>Update to ASCE standards.</td>
</tr>
<tr>
<td>Public Input No. 213-NFPA 5000-2015 [Sections A.15.1.2.2.2, A.15.1.2.3.2]</td>
<td>Deletion of Annex note.</td>
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<tr>
<td>Public Input No. 213-NFPA 5000-2015 [Sections A.15.1.2.2.2, A.15.1.2.3.2]</td>
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</tbody>
</table>

Submitter Information Verification

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Submittal Date: Mon Jul 06 14:48:15 EDT 2015

Committee Statement

Resolution: FR-6079-NFPA 5000-2015
Statement: ASCE 31 and FEMA 356 have been replaced with ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings. This FR cleans up the two sections.
Mass Notification

16.3.4.3.1 Mass Notification Risk Analysis. A Risk Analysis in accordance with section 9.6 of this code shall be conducted for new college and university buildings to determine the need for Mass Notification.

16.3.4.3.2 Emergency Response Plan. An emergency response plan shall be developed or modified for each College and University based on requirements of 55.2.

16.3.4.3.2.1 Where there is an emergency response plan in place, Mass Notification shall be implemented to provide emergency communication required by the emergency response plan.

Statement of Problem and Substantiation for Public Input

This will point to Chapter 9 for instructions. Within College Campus and Universities, dormitories are in this section, this is the reason for this section to point to Chapter 9.

The purpose for this Public Input seeks to provide a requirement that every new College and University Dormitory building conduct a Risk Analysis and create an Emergency Response Plan for their facility. The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security and our educational occupancies. We have learned from the recent incidents that occurred in our college/university campuses and other buildings, and have created installation guidelines to be followed for Life Safety. [Aurora, CO. Theater 2012; Columbine 1999; Virginia Tech 2007; Sandy Hook 2012; Weather Tornadoes/Storms]

NFPA 72 National Fire Alarm and Signaling Code has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the Risk Analysis and Emergency Response Plan as required in the above proposed sections.

This is NOT intended to require a Mass Notification System in every building. There are many elements contained within a Mass Notification System, the process of the Risk Analysis will outline what is needed based on Risk and engineering study for the occupancy. It will be the responsibility of the building/campus to react to the Risk Assessment.

An Emergency Response Plan will be needed for each College and University.

Submitter Information Verification

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<thead>
<tr>
<th>Submittal Date:</th>
<th>Thu Jul 02 10:47:55 EDT 2015</th>
</tr>
</thead>
</table>

**Committee Statement**

**Resolution:** FR-7-NFPA 5000-2015  
**Statement:** This will have Assembly occupancies over 500 people point to Chapter 9 for Risk Analysis and Emergency Response plans.

The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security.

NFPA 72 National Fire Alarm and Signaling Code has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the Risk Analysis and Emergency Response Plan as required in the above proposed sections.

This is NOT intended to require a Mass Notification System in every building. There are many elements contained within a Mass Notification System, the process of the Risk Analysis will outline what is needed based on Risk and engineering study for the occupancy.

A task group of the Assembly Occupancies Technical Committee was formed to continue review of the risk analysis concept and the applications stated above.


Title of New Content

16.3.4.4. Carbon Monoxide Detection.

16.3.4.4.1. Assembly occupancies with an occupant load of more than 50 shall be provided with carbon monoxide detection in accordance with Section 9.12 and shall install carbon monoxide detectors in the locations specified as follows:

(1) On the ceilings of rooms containing permanently installed fuel-burning appliances

(2) Centrally located within occupiable spaces served by the first supply air register from a permanently installed, fuel burning HVAC system

(3) Centrally located within occupiable spaces adjacent to a communicating attached garage

(4) Centrally located within occupiable spaces adjacent to an attached garage, with a separation wall constructed of gypsum wallboard

16.3.4.4.2. Carbon monoxide detectors as specified in 12.3.4.4.1 shall not be required in the following locations:

(1) Garages

(2) Occupiable spaces with communicating attached garages that are open parking structures as defined in 3.3.272.7.4

(3) Occupiable spaces with communicating attached garages that are mechanically ventilated in accordance with the mechanical code

(4) Occupiable spaces having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined in 3.3.272.7.4

(5) Occupiable spaces having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code

Statement of Problem and Substantiation for Public Input

This Public Input (PI) is intended to protect the public and workers from serious injury or possibly death from unintentional non-fire related carbon monoxide (CO) exposure by mandating the installation of CO detection devices in restaurants. This PI models the location requirements for restaurants after the requirements in the 2015 edition of NFPA 101 for CO detection in schools as a basis.

In the absence of a model building code for the installation of CO detection in restaurants many jurisdictions are developing their own regulations with varying installation requirements. For example as a result of the national publicity generated from an incident at a Long Island New York restaurant that sent 26 to the hospital and tragically killed the restaurant manager,

• Governor Cuomo signed AB 8963 into law expanding the state’s regulations to include the installation of CO detection in restaurants and other commercial buildings.

• The Town of North Hempstead New York enacted an ordinance 271-2014 requiring CO detection in places of assembly

• Nassau County New York approved ordinance Article VII requiring CO detection in commercial occupancies.
The following states have introduced legislation requiring CO detection in commercial occupancies:
• MA HB 2097: Requires carbon monoxide detection in all residential, commercial and governmental buildings.
• CT 5532: Amends part II of chapter 541 of the general statutes to require any person doing business in the state to equip the place of business physically located in this state with carbon monoxide detection and warning equipment.
• NJ S 2687 / A 4073: Requires the installation of carbon monoxide detection devices in all structures not currently required to have such devices. Currently, carbon monoxide detectors are required in hotels, multiple dwellings, rooming and boarding homes, and in single and two-family homes upon initial occupancy or change of occupancy.

Attached are twenty nine reports of CO incidents in restaurants from 2007 through 2014. Twenty of these incidents were caused by problems with a permanently installed fuel burning appliance. The efficacy of voluntary national consensus codes, such as the NFPA 101, ensures a collaborative, balanced, and consensus-based process.

Submitter Information Verification

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Submittal Date: Thu Jul 02 12:41:38 EDT 2015

Committee Statement

Resolution: FR-6-NFPA 5000-2015
Statement: This First Revision (FR) is intended to protect the public and workers from serious injury or possibly death from unintentional non-fire related carbon monoxide (CO) exposure by mandating the installation of CO detection devices in assembly occupancies. This FR models the location requirements for assembly occupancies after the requirements in the 2015 edition of NFPA 5000 for CO detection in schools as a basis.

In the absence of a model building code for the installation of CO detection in restaurants many jurisdictions are developing their own regulations with varying installation requirements. This First Revision adds the needed model language.
Public Input No. 67-NFPA 5000-2015 [ New Section after 17.2.3.2.1 ]

TITLE OF NEW CONTENT
17.2.3.2.2 In a corridor with a required capacity that is less than 100 the minimum width of the corridor shall be not less than 44 inches.

Statement of Problem and Substantiation for Public Input

6 ft. wide corridors are not needed for smaller schools with small populations. Some private schools, especially for special education students, may have as little as 15 students in the building. Some small schools will purchase an existing building, to house their program, and the corridors will not be 6 ft. in clear width.

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Submittal Date: Fri Jun 26 13:38:28 EDT 2015

Committee Statement

Resolution: FR-3005-NFPA 5000-2015
Statement: 6 ft. wide corridors are not needed for smaller schools with small populations. Some schools, especially for special education students, may have as few as 15 students in the building. Some small schools will purchase an existing building to house their program, and the corridors will not be 6 ft. in clear width.
17.3.4.3.1 Mass Notification Risk Analysis. A Risk Analysis in accordance with section 9.6 of this code shall be conducted for Education Occupancy to determine the need for Mass Notification.

17.3.4.3.2 Emergency Response Plan. An emergency response plan shall be developed or modified for each Education Occupancy per requirements of 55.2.

17.3.4.3.2.1 Where there is an emergency response plan in place, Mass Notification shall be implemented in accordance with the Risk Analysis to provide emergency communication required by the emergency response plan.

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to provide a requirement that every new educational occupancy conduct a Risk Analysis and create an Emergency Response Plan for their facility. The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security and our educational occupancies. We have learned from the recent incidents that occurred in our college/university campuses and other buildings, and have created installation guidelines to be followed for Life Safety. [Aurora, CO. Theater 2012; Columbine 1999; Virginia Tech 2007; Sandy Hook 2012; Weather Tornadoes/Storms]

The NFPA 101 scope is focused on Fire Safety, but the core is egress and it does include all the essential considerations that impact life safety and egress. When a mass disaster event occurs, and they are occurring, the need for real time information communicated in a clear and concise method via various paths is very critical to Life Safety. The Risk Analysis and the Emergency Response Plan have been shown to be the needed steps to take in this complicated life safety concern today and in the future.

NFPA 72 National Fire Alarm and Signaling Code has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the Risk Analysis and Emergency Response Plan as required in the above proposed sections.

This is NOT intended to require a Mass Notification System in every educational occupancy. There are many elements contained within a Mass Notification System, the process of the Risk Analysis will outline what is needed based on Risk and engineering study for the occupancy. It will be the responsibility of the education occupancy to react to the Risk Assessment.

An Emergency Response Plan will be needed for each educational occupancy.

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<thead>
<tr>
<th>State:</th>
<th>Zip:</th>
<th>Submittal Date:</th>
<th>Wed Jul 01 14:58:23 EDT 2015</th>
</tr>
</thead>
</table>

**Committee Statement**

- **Resolution:** FR-3008-NFPA 5000-2015
- **Statement:** The new provisions of Section 55.13 for risk analysis for mass notification systems are appropriate for application to educational occupancies.
17.3.4.4 Carbon Monoxide Alarms and Carbon Monoxide Detection Systems.

17.3.4.4.1 Carbon monoxide alarms or carbon monoxide detectors in accordance with Section 55.11 shall be provided in new educational occupancies in the locations specified as follows:

1. On the ceilings of rooms containing permanently installed fuel-burning appliances
2. Centrally located within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system
3. Centrally located within occupiable spaces adjacent to a communicating attached garage
4. Centrally located within occupiable spaces adjacent to an attached garage with a separation wall constructed of gypsum

17.3.4.4.2 Carbon monoxide alarms and carbon monoxide detectors as specified in 17.3.4.4.1 shall not be required in the following locations:

1. Garages
2. Occupiable spaces with communicating attached garages that are open parking structures as defined in 3.3.628.11.4
3. Occupiable spaces with communicating attached garages that are mechanically ventilated in accordance with the applicable mechanical code
4. Occupiable spaces having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined in 3.3.631.11.4
5. Occupiable spaces having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to protect building occupants from serious injury or possibly death from unintentional, non-fire related carbon monoxide (CO) exposure emanating from attached garages without communicating openings. A recently published Fire Protection Research Foundation (FPRF) report Carbon Monoxide Diffusion Project confirms that CO gas is capable of diffusing through porous walls at a rate that presents a danger to building occupants. The Public Input deletes the term "communicating".

In preparing the report the, Imperial College London analyzed data from laboratory experiments and found five reported incidents of CO poisoning. Their analysis confirms the transport of CO through porous walls and the findings merit consideration in current life safety codes.

Submitter Information Verification

Submitter Full Name: VINCE BACLAWSKI
Organization: NEMA
Committee Statement

Resolution:  FR-3002-NFPA 5000-2015
Statement:  FR-3001 is making changes to 17.3.4.4.1 and 17.3.4.4.2 separately from this Global FR. The committee wants the two subjects balloted separately. The issue to which this Global FR relates is the fact that carbon monoxide can pass through gypsum board wall assemblies. See also FR-3001 which is concerned with carrying the alarm notification to an occupied location so that someone can take corrective action.
17.3.4.4 Carbon Monoxide Alarms and Carbon Monoxide Detection Systems.

17.3.4.4.1 Carbon monoxide alarms or carbon monoxide detectors in accordance with Section 55.11 shall be provided in new educational occupancies in the locations specified as follows:

1. On the ceilings of rooms containing permanently installed fuel-burning appliances.
2. Centrally located within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system.
3. Centrally located within occupiable spaces adjacent to a communicating attached garage.

17.3.4.4.2 Where carbon monoxide detectors are installed in accordance with 17.3.4.4.1(1), the alarm signal shall be automatically transmitted to an approved onsite location or to an off-premises location in accordance with NFPA 720.

17.3.4.4.3 Carbon monoxide alarms and carbon monoxide detectors as specified in 17.3.4.4.1 shall not be required in the following locations:

1. Garages.
2. Occupiable spaces with communicating attached garages that are open parking structures as defined in 3.3.628.11.4.
3. Occupiable spaces with communicating attached garages that are mechanically ventilated in accordance with the applicable mechanical code.

Statement of Problem and Substantiation for Public Input

This Public Input seeks to make sure the carbon monoxide audible alarm and trouble signal will be heard so that appropriate action will be taken.

The objective of installing carbon monoxide detection/notification devices in occupied spaces is to wake/alert occupants so they can exit the premises. However, installations in furnace or boiler rooms, as is required by 17.3.4.4.1(1) should be designed so that a responsible party can take immediate action if a fuel-burning appliance malfunctions, potentially spreading carbon monoxide throughout the occupancy. Such rooms are often not regularly staffed. Therefore, the notification in such installations should sound in a constantly attended location, so that action can be taken quickly.

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| Submittal Date: | Thu Jul 02 13:39:44 EDT 2015  

**Committee Statement**

**Resolution:** FR-3001-NFPA 5000-2015  
**Statement:** This First Revision seeks to ensure that the carbon monoxide audible alarm and trouble signal will be heard so that appropriate action will be taken.

The objective of installing carbon monoxide detection/notification devices in occupied spaces is to wake/alert occupants so they can exit the premises. However, installations in furnace or boiler rooms, as is required by 17.3.4.4.1(1) should be designed so that a responsible party can take immediate action if a fuel-burning appliance malfunctions, potentially spreading carbon monoxide throughout the occupancy. Such rooms are often not regularly staffed. Therefore, the notification in such installations should sound in a constantly attended location, so that action can be taken quickly.

The term "carbon monoxide alarms" is being deleted as listing of such devices per UL 2034 is only for dwelling units. System detectors are listed to UL 2075.
Public Input No. 105-NFPA 5000-2015 [ Section No. 17.3.5.1 ]

17.3.5.1

Educational occupancy buildings. New educational occupancy buildings shall be protected throughout by an approved, electrically supervised automatic sprinkler system in accordance with Section 55.3.

17.3.5.1.1

Existing educational occupancy buildings exceeding 12,000 ft$^2$ (1120 m$^2$) shall be protected throughout by an approved, electrically supervised automatic sprinkler system in accordance with Section 55.3.

Statement of Problem and Substantiation for Public Input

This proposal correlates to NFPA 101 PI 296

Fully sprinklered schools provide active fire protection regardless of any scenario it is used for. Public schools are often used as a public shelter, before or after a tornado, hurricane, flood, wild fire, etc. Some states, such as Florida, require new schools be built as public shelters. In many emergencies, natural or man-made disasters, a school becomes the center for several temporary occupancies and agencies that providing emergency services, such as cooking, nursing, surgery, psychiatric, along with housing, to area residents. All of these emergency uses, if built separately from a school, require sprinklers.

The "NFPA School Safety, Codes and Security Workshop" report from December of 2014, makes several suggestions to improve school security. Several areas of the report suggest improving fire protection, such as fire sprinklers, in order to facilitate egress options. One example is delayed evacuation when lockdown procedures are implemented. A procedure that holds students and staff in an area, preventing egress after fire alarm activation is a concept contrary to the life safety code. Only by mandating an active fire protection system is this even remotely possible.

Schools are a significant investment by the community, state and federal government. Losing schools through fire is irresponsible planning and the cost to rebuild bears a heavy burden to the school district and local taxpayers. According to 2013 NFPA report titled, "Structure Fires in Educational Properties", the abstract states, "In 2007-2011, U.S. fire departments responded to an estimated average of 5,690 structure fires in educational properties, annually. These fires caused an annual average of 85 civilian fire injuries and $92 million in direct property damage." When sprinklers are installed, there is 62% less in fire damage.

Mandating sprinklers is only part of the emergency planning and by no means solves all of the security aspects of schools. However, from experience, it is one of the more easier obtainable of all goals and provides a safe environment from fire.

Submitter Information Verification

Submitter Full Name: JEFFREY HUGO
Committee Statement

Resolution: FR-3009-NFPA 5000-2015

Statement: Fully sprinklered schools provide active fire protection regardless of any scenario for which it is used. Public schools are often used as a public shelter, before or after a tornado, hurricane, flood, wild fire, etc. Some states require new schools be built as public shelters. In many emergencies, natural or man-made disasters, a school becomes the center for several temporary occupancies and agencies that providing emergency services, such as cooking, nursing, surgery, psychiatric, along with housing, to area residents. All of these emergency uses, if built separately from a school, require sprinklers.

The "NFPA School Safety, Codes and Security Workshop" report from December of 2014, makes several suggestions to improve school security. Several areas of the report suggest improving fire protection, such as fire sprinklers, in order to facilitate egress options. One example is delayed evacuation when lockdown procedures are implemented. A procedure that holds students and staff in an area, preventing egress after fire alarm activation is a concept contrary to the life safety code. Only by mandating an active fire protection system is this even remotely possible.

Schools are a significant investment by the community, state and federal government. Losing schools through fire is irresponsible planning and the cost to rebuild bears a heavy burden to the school district and local taxpayers. According to 2013 NFPA report titled, "Structure Fires in Educational Properties", the abstract states, "In 2007-2011, U.S. fire departments responded to an estimated average of 5,690 structure fires in educational properties, annually. These fires caused an annual average of 85 civilian fire injuries and $92 million in direct property damage." When sprinklers are installed, there is 62% less in fire damage.

Mandating sprinklers is only part of the emergency planning and by no means solves all of the security aspects of schools. However, from experience, it is one of the more easily obtainable of all goals and provides a safe environment from fire.
18.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers

18.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers. New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 18.5.5.1, 18.5.5.2, and 18.5.5.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 11.1.6.4, the requirements of 18.5.5.1, 18.5.5.2 and 18.5.5.3 shall apply only if grab bars are installed.

18.5.5.1* A vertical grab bar shall be provided either [option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 18.5.5.1.1 or [option 2] as a free standing, external pole as specified in 18.5.5.1.2

18.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

18.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

18.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [Option 1] as a diagonal grab bar as specified in 18.5.5.2.1 or [Option 2] as a horizontal grab bar as specified in 18.5.5.2.2

18.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

18.5.5.2.2* [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

18.5.5.3.1* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 18.5.5.

18.5.5.3.2 Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.)
### Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an uploaded accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.

1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other
health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost and disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

Submitter Information Verification

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Committee Statement

Resolution: FR-3012-NFPA 5000-2015
Statement: The new provisions of 11.1.6.5 for grab bars are appropriate for application to day-care occupancies.
Detailed Justification for Proposals for New Requirements for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code)
Chapters, specifically Section —.5 Services, in:

- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:

“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].

Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

- ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

Features of the Specified Grab Bars. The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:

X.5.5.1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
X.5.5.2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

Two Details of Design and Installation.

1. Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

**Current Exemplars.** Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the young adult victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

**Comparisons of Three Prominent Dangers.** Grab bars are just as important—for everyone—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—by all users. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.

![Pie chart showing the number of injuries associated with baths and showers in the USA in 2010](chart.png)

*Sources: NFPA and CPSC/NEISS*
Injury Epidemiology. The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

Ergonomic Perspectives on the Special Dangers of Baths and Showers. What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

Societal Injury Costs. The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. Injury Prevention, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. Injury Prevention, 2008, 14: 329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” Technology and Disability 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation—a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—R. Stirling Ferguson—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

Public Policies. Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
22 YOF SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.
23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.
40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
21 MOM RUPTURED AN EAR DRUM WITH A COTTON-TIPPED SWAB WHILE BATHING IN TUB AT HOME.
48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.
04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR
10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO
80 YOF FELL IN SHOWER AT HOME HIT HEAD DX/ HEAD INJURY
94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR DX/ FACIAL FX
55 YOM SLL LEG HEMATOMA
72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.
22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.
26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN
90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION
30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK
51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC
60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX
44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME DX/ ABDOMINAL CONTUSION
04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE
51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.
33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION
23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.
62 YOM WITH BACK PAIN FELL INTO TUB DX; CONTUSION TO LOWER BACK
63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS
54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE

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02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX:// RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUMPED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOF FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
89 YOM WAS WASHING HIMSELF IN SHOWER, FELL ONTO BLUNT PART OF BATHTUB, IMMEDIATELY HAD PAIN & TROUBLE BREATHING. DX - MULTIPLE RIB FXS
56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTIGN HER FACE & INJURING HER RT ARM- DX- MECHANICAL FALL W/ FRACTURE RT SHOULDER
78 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER;SHOULDER INJURY
47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX - BLUNT HEAD TRAUMA W/BRIEF LOC
62 YOM HAD A SYNCOPAL TODAY AT HOME IN THE SHOWER INJURING EYE AREA - DX- LACERATION TO FACE (EYE)
56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER HIP, INJURING HER RT ARM- DX- MECHANICAL FALL W/ FRACTURE RT LOWER TRUNK (HIP)
47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX - BLUNT HEAD TRAUMA W/BRIEF LOC
80 YOF PRESENT TO ER FROM HOME WHEN SHE WAS TAKING A BATH AND COLLAPSED - DX- CARDIAC ARREST, RESUSCITAED
43 YOM PRESENT TO ER AFTER HE WAS IN THE BATHTUB AND SLIP AND FELL GETTING OUT HITTING HEAD ON FLOOR- DX- BLUNT HEAD TRAUMA
81 YOM PRESENT TO ER AFTER A FALL IN THE SHOWER AT HOME TODAY INJURING THE HEAD AREA- DX- BLUNT HEAD TRAUMA
47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX - BLUNT HEAD TRAUMA W/BRIEF LOC
88 YOF PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING RT HIP- DX- FRACTURE RT LOWER TRUNK (HIP)
88 YOF PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING RT HIP- DX- FRACTURE RT LOWER TRUNK (HIP)
80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM STOOD ON THE TOILET, OPENED WIN***, SLIPPED BETWEEN TOILET/TUB; PELVIC FX
44 YOF FELL IN SHOWER TODAY SUSTAINING HEAD INJURY. DX - SCALP LACERATION
37 YOM HAD A GROUND LEVEL FALL IN BATHROOM STRIKING LOWER BACK ON BATHTUB. DX - SPINAL CONTUSION
84 YOF HAD SYNCOPAL EPISODE IN SHOWER AND FELL. DX: L 10TH RIB FX, INABILITY TO AMBULATE.
87 YOF FELL IN SHOWER. DX: RHABDOMYOLYSIS.
93 YOF FELL IN SHOWER AT ASSISTED LIVING. DX: L DISTAL HUMERUS FX.
79 YOM FELL IN SHOWER. DX: A FIB W/RAPID VENTRICULAR RESP, SYNCOPE, SDH, SAH, ELEVATED INR.
84 YOF FELL WHILE GETTING OUT OF BATHTUB SUSTAINING A FRACTURE TO HER LUMBAR SPINE
90 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: R KNEE STRAIN W/POS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.
82 YOF WITH NO INJ FROM FALL IN TUB
85 YOM WITH NO INJ, FELL IN BATHTUB, ADMITTED FOR OTHER REAONS
52 YOM W/ALS FELL AND BECAME STUCK BETWEEN TOILET AND TUB. DX: RHABDOMYOLYSIS STATUS POST FALL, NASAL FX.
95 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION
71 YOF SLIPPED AND FELL IN SHOWER. DX: SYNCOPE, LARGE HEAD LAC, COAGULOPATHY, HYPOKALEMIA, LONT QT, ALCO
79 YOF FELL IN SHOWER SUSTAINING A FRACTURED KNEE
87 YOF WITH RIB FRACTURE FROM FALL IN TUB
79 YOM WITH LOWER BACK STRAIN FROM FALL IN SHOWER
81 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP
97 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.
70 YOF FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP, SUSTAINED CH, BACK CONTUSIONS
88 YOF SLIPPED IN WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.
41 YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED
83 YOM FELL IN THE SHOWER. DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/O LOC, RENAL FAILURE.
94 YOM FELL GETTING OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION
79 YOM FELL ON SIDE OF BATHTUB. DX: SYNCOPE, CHEST WALL CONT.
55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.
86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ ACUTE DEHYDRATED
95 YOF TRIPPED OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME DX: AVULSION TO FACE/ MALIGNANT HYPERTENSION
53 YOM SLIPPED IN SHOWER AND FELL HITTING HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES
Public Input No. 68-NFPA 5000-2015 [ New Section after 18.6.3.4.2 ]

TITLE OF NEW CONTENT

(New) 18.6.3.4.2 (Renumber rest) Compliance with 18.6.3.4.2 will not be required if all the following conditions are provided:

1. Smoke alarms connected to the building’s electric are installed in accordance with 55.2.2.10 in the corridor serving the day care home.

2. Smoke alarms connected to the building’s electric are installed in accordance with 55.2.2.10 within the day-care home pursuant to 18.6.3.4 as well as within 15 ft. of all sleeping rooms.

3. All smoke alarms in (1) and (2) shall be arranged so that operation of any smoke alarm shall cause all the smoke alarms within the corridor and the day-care home to sound.

4. The day care home located in a building of another occupancy where the other occupancy would not require a fire alarm system that complies with 9.6 pursuant to another section of the Code.

Statement of Problem and Substantiation for Public Input

This alternative fire protection design is financially feasible for day-care home owners and will provide adequate protection. The purpose of Sections 16.6.3.4.2 is to protect the egress corridor for the day-care home clients and staff. The protection of other occupants of the building is not within the scope of the detection requirements in 16.6.3.4.2. This option can only be used in a building that is not required to have an NFPA 72 fire alarm system as required by another chapter in NFPA 5000. The interconnected smoke alarm system will sound within the corridor as well as within the day-care home providing notification of smoke and fire in both of those areas as intended by 16.6.3.4.2 without the financial hardship created by the NFPA 72 detection system.

Submitter Information Verification

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Submittal Date: Fri Jun 26 13:56:32 EDT 2015

Committee Statement

Resolution: FR-3016-NFPA 5000-2015
Statement: This alternative fire protection design is financially feasible for day-care home owners and will provide adequate protection. The purpose of 18.6.3.4.2 is to protect the egress corridor for the day-care home clients and staff. The protection of other occupants of the building is not within the scope of the detection requirements in 18.6.3.4.2. This option can only be used in a building that is not required to have an NFPA 72 fire alarm system
as required by another chapter in NFPA 101. The interconnected smoke alarm system will sound within the corridor as well as within the day-care home providing notification of smoke and fire in both of those areas as intended by 1686.3.4.2 without the financial hardship created by the NFPA 72 detection system.
Public Input No. 84-NFPA 5000-2015 [Section No. 19.3.4.5.3]

19.3.4.5.3 Nursing Homes.

An approved automatic smoke detection system shall be installed in corridors throughout smoke compartments containing patient sleeping rooms and in spaces open to corridors as permitted in nursing homes by

- Detection in Patient Sleeping Rooms. Approved smoke detection shall be provided in all patient sleeping rooms

19.3.6.1, unless otherwise permitted by one of the following:

- Corridor systems shall not be required where each patient sleeping room is protected by an approved smoke detection system.

- Corridor systems shall not be required where patient room doors are equipped with automatic door-closing devices with integral smoke detectors on the room side installed in accordance with their listing, provided that the integral detectors provide occupant notification.

4.5.3.1 Patient room smoke detectors shall be connected to the building fire alarm system for supervision and notification.

19.3.4.5.3.2* Patient room smoke detectors shall be allowed to provide Positive Alarm Sequence or Presignal Feature as per NFPA 72 Chapter 23.

Additional Proposed Changes

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
<th>Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFPA_5000_19_3_4_5_Patient_Rm_SD_PI_FINAL.pdf</td>
<td>Substantiation of 5000 19.3.4.5 and background information</td>
<td></td>
</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Input

This Public Input seeks early warning smoke detection coverage in healthcare patient rooms. Within all national model building and fire codes, smoke detection is required to provide the minimum level of life safety in all sleeping areas. Healthcare is the only area in our nation today that does not provide this level of early warning and life safety. An historic review would show that patient rooms in the past were deemed to not need smoke detection because of the room configuration and direct line of sight with nurses and nursing stations. Staffing has been at a very competent level in the healthcare industry as a general rule.

This Public Input addresses new construction of hospitals and our healthcare patient rooms. In most cases going forward patient rooms are single patient, with all the amenities of a home bedroom with the added risk of flammable gases and extensive electrical monitoring and medical equipment. The concept of a staffed “nurse’s station” is changing to where attendant on duty may no longer have direct visual and audible awareness of the early development of an electrical or other fire within the room of a patient. As a result, a staff attendant at a nurse’s station may not be capable of responding in a time critical manner to the early developments of a fire in a patient’s room.

Early warning smoke detection with the required automatic fire sprinkler protection is needed for the minimum level of life safety for our sick, medicated and those receiving medical attention in our
This Public Input would delete the requirement for corridor smoke detection in Nursing Homes with smoke detection in each patient room.

Today's system connected smoke detection is advanced and is immune to activation by deceptive phenomenon which in past caused unwanted alarms. Multi-criteria and multi-sensor detection technology has risen to provide reliable, fast responding early warning detection that also reduces the testing and maintenance costs with the level of technology that is standard.

Key areas of change within healthcare facilities

  - ABHR Alcohol Based Hand Rub units are in the patient rooms; these are typically flammable liquids and can contribute to smoke/fire and its spread.
  - Patient rooms often have anterooms that divide them from the main rooms, providing areas for smoke to collect in the patient room and not being seen from the corridor. (figure B)
- Move towards residential setting. Patient rooms including those in nursing homes are moving towards a more comfortable residential setting that allows patients to hang more combustible items on their walls, and furniture from the home setting. As mentioned above the vast majority is single patient and some are apartment-like. The advancements and use of fire sprinklers has allowed this action, but the hazard for smoke/fire has increased with this movement.
- Early warning detection is needed—same as in our homes.

Fire-Loss of Life Incidents:

- Good news is that loss of life has been the lowest in years; this can be attributed to fire sprinklers, fire detection/alarm and the excellent staff response in our legacy healthcare facilities. As outlined throughout this report, the risk for fire occurrence, injury and death is increasing.
  - Fire was apparently caused by use of an electronic defibrillator in a patient room
- Between 2004 and 2006, there was an average of 6,400 fires in medical facilities each year that were responsible for approximately 5 civilian fire deaths, 175 injuries, and $34 million in property loss annually. [Medical facilities include hospitals, clinics, infirmaries, and other facilities that provide care to the sick and injured. Fires in these buildings can be particularly dangerous due to the presence of oxygen and other flammable substances and the challenge of evacuating patients who may not be ambulatory. [https://www.usfa.fema.gov/downloads/pdf/statistics/v9i4.pdf]
- Fires in health care facilities [Report: NFPA's "Fires in Health Care Facilities"
  - In 2006-2010, U.S. fire departments responded to an estimated average of 6,240 structure fires in or on health care properties per year. These fires caused an average of six civilian deaths, 171 civilian injuries and $52.1 million in direct property damage annually.

Submitter Information Verification

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Submittal Date: Thu Jul 02 12:55:41 EDT 2015

Committee Statement
Resolution: The need for the change is portrayed as a future problem based on changing design and furnishings trends. So, there is currently no problem that needs fixing. Fire data shows seven deaths per year in mid 1980s and six deaths per year in 2010 in health care occupancies. These figures show that the code’s goals and objectives (protection of occupants not intimate with initial fire development) are being met. The additional installation, testing and maintenance costs and negative operational impact (nuisance alarms, deterring staff from normal assigned duties, etc.) have not been justified.
BLD-HEA Proposed Text of Public Input:

19.3.4.5 Detection.
19.3.4.5.1 General. Detection systems, where required, shall be in accordance with Section 9.6.
19.3.4.5.2 Detection in Spaces Open to Corridors. See 18.3.6.1.
19.3.4.5.3* Nursing Homes. An approved automatic smoke detection system shall be installed in corridors throughout smoke compartments containing patient sleeping rooms and in spaces open to corridors as permitted in nursing homes by 18.3.6.1, unless otherwise permitted by one of the following:
   (1) Corridor systems shall not be required where each patient sleeping room is protected by an approved smoke detection system.
   (2) Corridor systems shall not be required where patient room doors are equipped with automatic door-closing devices with integral smoke detectors on the room side installed in accordance with their listing, provided that the integral detectors provide occupant notification.

19.3.4.5.3* Detection in Patient Sleeping Rooms. Approved smoke detection shall be provided in all patient sleeping rooms.

19.3.4.5.3.1 Patient room smoke detectors shall be connected to the building fire alarm system for supervision and notification.

19.3.4.5.3.2* Patient room smoke detectors shall be allowed to provide Positive Alarm Sequence or Presignal Feature as per NFPA 72 Chapter 23.

BLD-HEA Statement of Problem and Substantiation of Public Input:

This Public Input seeks early warning smoke detection coverage in healthcare patient rooms. Within all national model building and fire codes, smoke detection is required to provide the minimum level of life safety in all sleeping areas. Healthcare is the only area in our nation today that does not provide this level of early warning and life safety. An historic review would show that patient rooms in the past were deemed to not need smoke detection because of the room configuration and direct line of sight with nurses and nursing stations. Staffing has been at a very competent level in the healthcare industry as a general rule.

This Public Input addresses new construction of hospitals and our healthcare patient rooms. In most cases going forward patient rooms are single patient, with all the amenities of a home bedroom with the added risk of flammable gases and extensive electrical monitoring and medical equipment. The concept of a staffed “nurse’s station” is changing to where attendant on duty may no longer have direct visual and audible awareness of the early development of an electrical or other fire within the room of a patient. As a result, a staff attendant at a nurse’s station may not be capable of responding in a time critical manner to the early developments of a fire in a patient’s room.
Early warning smoke detection with the required automatic fire sprinkler protection is needed for the minimum level of life safety for our sick, medicated and those receiving medical attention in our healthcare facilities.

This Public Input would delete the requirement for corridor smoke detection in Nursing Homes with smoke detection in each patient room.

Today’s system connected smoke detection is advanced and is immune to activation by deceptive phenomenon which in past caused unwanted alarms. Multi-criteria and multi-sensor detection technology has risen to provide reliable, fast responding early warning detection that also reduces the testing and maintenance costs with the level of technology that is standard.

Key areas of change within healthcare facilities

  - ABHR Alcohol Based Hand Rub units are in the patient rooms; these are typically flammable liquids and can contribute to smoke/fire and its spread.
  - Patient rooms often have anterooms that divide them from the main rooms, providing areas for smoke to collect in the patient room and not being seen from the corridor. (figure B)

- Move towards residential setting. Patient rooms including those in nursing homes are moving towards a more comfortable residential setting that allows patients to hang more combustible items on their walls, and furniture from the home setting. As mentioned above the vast majority is single patient and some are apartment-like. The advancements and use of fire sprinklers has allowed this action, but the hazard for smoke/fire has increased with this movement.

- Early warning detection is needed—same as in our homes.

Fire-Loss of Life Incidents:

- Good news is that loss of life has been the lowest in years; this can be attributed to fire sprinklers, fire detection/alarm and the excellent staff response in our legacy healthcare facilities. As outlined throughout this report, the risk for fire occurrence, injury and death is increasing.

- Fire (2012) at North Carolina hospital kills one patient, injures three.
  - Fire was apparently caused by use of an electronic defibrillator in a patient room
Between 2004 and 2006, there was an average of 6,400 fires in medical facilities each year that were responsible for approximately 5 civilian fire deaths, 175 injuries, and $34 million in property loss annually. Medical facilities include hospitals, clinics, infirmaries, and other facilities that provide care to the sick and injured. Fires in these buildings can be particularly dangerous due to the presence of oxygen and other flammable substances and the challenge of evacuating patients who may not be ambulatory.


Fires in health care facilities Report: NFPA's "Fires in Health Care Facilities"

- In 2006-2010, U.S. fire departments responded to an estimated average of 6,240 structure fires in or on health care properties per year. These fires caused an average of six civilian deaths, 171 civilian injuries and $52.1 million in direct property damage annually.

Supporting Research: Performance of Smoke Detectors and Sprinklers in Residential and Health-Care Occupancies,
James A. Milke, Ph.D., P.E., University of Maryland, May 14, 2010


Summary

The relative role of smoke alarms and sprinklers has been demonstrated in numerous recent research investigations. The trend in all of the studies is that smoke alarms respond prior to residential or sprinklers and thus have the capability of providing the earliest warning of a fire to building occupants. While responding later, sprinklers provide the additional function of fire suppression to limit the development of hazardous conditions.

From the analysis of NFIRS fire incident data in this study, the proportion of fires judged to be too small for operation of the smoke detectors was appreciably fewer those for sprinklers in all three occupancy groups analyzed. The following table summarizes the results.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Smoke Detectors</th>
<th>Sprinklers</th>
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<tbody>
<tr>
<td>Non-sprinklered property</td>
<td>13.1</td>
<td>12.8</td>
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<tr>
<td>1- and 2-family dwelling</td>
<td>12.8</td>
<td>38.9</td>
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</table>
The fact that fewer fires are judged to be too small for smoke detector operation than sprinklers, especially when both are present in sprinklered buildings, reflects the faster response capabilities of smoke detectors.

While Bill’s (Bill, Robert, 1990) following quote on the benefit of smoke detectors was relative to an experimental program for hotel rooms, the comment is applicable to a wide variety of occupancies, as reflected in the variety of experimental and statistical indications:

“The role of smoke detectors in life safety has also been clearly shown. Smoke detectors warn room occupants in either fast-growing or smoldering fires while the room environment is such that an occupant can easily escape. Moreover, the warning occurs when the fire is small. Thus, the fire may possibly be extinguished without intervention of sprinklers.”

The need for warning while the fire is small is reflected in the casualty statistics for those fires which are judged too small for smoke detector and sprinkler activation. Even for these “small” fires, some casualties do occur.

Nonetheless, where fire control is provided by sprinklers, rather than extinguishment, the environment following sprinkler operation is not pristine. This is caused by a decrease in the efficiency of the combustion process caused by the water application from sprinklers on burning fuels. In such instances, the generation of carbon monoxide increases during fire control. In addition, light obscuration becomes very significant throughout the room of origin, especially in small rooms. Such small rooms are characteristic of residences and health care facilities.

As such, having both smoke alarms and sprinklers has significant advantages. With smoke alarms providing the early indication of fires, this permits people to evacuate (or be evacuated if assistance is needed) prior to the response of sprinklers. In this way, people can evacuate prior to the potential loss of visibility in the room of origin (and thus find their way most easily without encountering obstructions) and not be subjected to the increase in carbon monoxide (and other gases produced from incomplete combustion).

### Conclusion:

<table>
<thead>
<tr>
<th></th>
<th>Commercial residential</th>
<th>9.7</th>
<th>10.8</th>
<th>54.2</th>
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<tr>
<td>Health-care</td>
<td></td>
<td>11.4</td>
<td>17.8</td>
<td>65.4</td>
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</table>
Our healthcare system is changing; our patient rooms in hospitals and nursing homes are changing. They contain the same level, if not greater fire safety risks as our homes, dormitories, hotels and all sleeping areas that are protected by Early Warning Smoke Detection. It is time for our patients in our new healthcare facilities to have the level of safety. Smoke detection and Fire Sprinklers will save lives in our healthcare patient rooms. Smoke detection in our patient rooms is the right fire life safety action to take.

Figure A

![Figure A](image1)

Figure B

![Figure B](image2)
19.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers

19.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers. New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 19.5.5.1, 19.5.5.2, and 19.5.5.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 11.1.6.4, the requirements of 19.5.5.1, 19.5.5.2 and 19.5.5.3 shall apply only if grab bars are installed.

19.5.5.1 A vertical grab bar shall be provided either [option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 19.5.5.1.1 or [option 2] as a free standing, external pole as specified in 19.5.5.1.2

19.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

19.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

19.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [option 1] as a diagonal grab bar as specified in 19.5.5.2.1 or [option 2] as a horizontal grab bar as specified in 19.5.5.2.2

19.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

19.5.5.2.2 [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

19.5.5.3* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 19.5.5.

19.5.5.3.2 Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.
Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.
1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other
health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost and disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA's currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

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Submittal Date: Sun Jul 05 13:07:30 EDT 2015

Committee Statement

Resolution: The Chapter 11 new grab bar provisions might be appropriate for health care occupancies, but the HEA committee wants to study the implications. The material is presented as a Committee Input (CI) to permit the committee to revisit the subject during Second Draft preparation. See CI-4506-NFPA 5000-2015.
Detailed Justification for Proposals for New Requirements
for Grab Bars for New Baths and Showers

Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code)
Chapters, specifically Section —.5 Services, in:

- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:

“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].

Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

• ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
• high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily, are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

Features of the Specified Grab Bars. The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:

X.5.5.1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;

X.5.5.2 Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

Two Details of Design and Installation.

(1) Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

**Current Exemplars.** Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the young adult victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

**Comparisons of Three Prominent Dangers.** Grab bars are just as important—for everyone—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—by all users. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.
**Injury Epidemiology.** The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

**Ergonomic Perspectives on the Special Dangers of Baths and Showers.** What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

**Societal Injury Costs.** The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. Injury Prevention, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. Injury Prevention, 2008, 14: 329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” Technology and Disability 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation-a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—R. Stirling Ferguson—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

**Public Policies.** Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

**Summing Up.** The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
18 YOF SPRAINED HER LOWER BACK BY FALLING IN THE SHOWER AT SCHOOL.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.
22 YOM SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.
23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.
40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
21 MOM RUPTURED AN EAR DRUM WITH A COTTON-TIPPED SWAB WHILE BATHING IN TUB AT HOME.
48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.
04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR
10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO
80 YOF FELL IN SHOWER AT HOME HIT HEAD DX/ HEAD INJURY
94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR DX/ FACIAL FX
55 YOM SLL LEG HEMATOMA
72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.
22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.
26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN
90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION
30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK
51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC
60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX
44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME DX/ ABDOMINAL CONTUSION
04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE
51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.
33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION
23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.
62 YOM WITH BACK PAIN FELL INTO TUB DX; CONTUSION TO LOWER BACK
63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS
54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTNG HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX// RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUMPED RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOF FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital

(Producto Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
89 YOF SUSTAINED A FALL IN THE SHOWER AT HOME, UNDERNEATH THE SHOWER INJURIES TO THE HEAD AND SHOULDERS.

85 YOM WITH NO INJURIES FROM FALL IN SHOWER, AND HITTING THE HEAD ON THE WALL.

84 YOM DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM TO SMOK, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

92 YOM SLIPPED IN THE SHOWER STANDING UPRIGHT AND HITTER THE HIP ON THE TOILET AT HOME.

94 YOM FELL IN THE SHOWER AT HOME AND HITTING THE HEAD SUSTAINING A LACERATION.

88 YOF FELL IN THE SHOWER AT HOME, HITTING THE HEAD ON THE TUB, SUSTAINING A LACERATION.

80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM TO SMOK, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

85 YOM WITH NO INJURIES FROM FALL IN SHOWER, AND HITTING THE HEAD ON THE WALL.

84 YOM DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM TO SMOK, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

85 YOM WITH NO INJURIES FROM FALL IN SHOWER, AND HITTING THE HEAD ON THE WALL.

86 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
89 YOF SUSTAINED A FALL IN THE SHOWER AT HOME, UNDERNEATH THE SHOWER INJURIES TO THE HEAD AND SHOULDERS.

92 YOM SLIPPED IN THE SHOWER STANDING UPRIGHT AND HITTER THE HIP ON THE TOILET AT HOME.

94 YOM FELL IN THE SHOWER AT HOME AND HITTING THE HEAD SUSTAINING A LACERATION.

88 YOF FELL IN THE SHOWER AT HOME, HITTING THE HEAD ON THE TUB, SUSTAINING A LACERATION.

80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM TO SMOK, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

85 YOM WITH NO INJURIES FROM FALL IN SHOWER, AND HITTING THE HEAD ON THE WALL.

84 YOM DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM TO SMOK, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

85 YOM WITH NO INJURIES FROM FALL IN SHOWER, AND HITTING THE HEAD ON THE WALL.

86 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
89 YOF SUSTAINED A FALL IN THE SHOWER AT HOME, UNDERNEATH THE SHOWER INJURIES TO THE HEAD AND SHOULDERS.

92 YOM SLIPPED IN THE SHOWER STANDING UPRIGHT AND HITTER THE HIP ON THE TOILET AT HOME.

94 YOM FELL IN THE SHOWER AT HOME AND HITTING THE HEAD SUSTAINING A LACERATION.

88 YOF FELL IN THE SHOWER AT HOME, HITTING THE HEAD ON THE TUB, SUSTAINING A LACERATION.

80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM TO SMOK, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

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89 YOF SUSTAINED A FALL IN THE SHOWER AT HOME, UNDERNEATH THE SHOWER INJURIES TO THE HEAD AND SHOULDERS.

92 YOM SLIPPED IN THE SHOWER STANDING UPRIGHT AND HITTER THE HIP ON THE TOILET AT HOME.

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89 YOF SUSTAINED A FALL IN THE SHOWER AT HOME, UNDERNEATH THE SHOWER INJURIES TO THE HEAD AND SHOULDERS.

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85 YOM WITH NO INJURIES FROM FALL IN SHOWER, AND HITTING THE HEAD ON THE WALL.
Public Input No. 155-NFPA 5000-2015 [ New Section after 20.5.4 ]

20.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers

20.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers. New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 20.5.5.1, 20.5.5.2, and 20.5.5.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 11.1.6.4, the requirements of 20.5.5.1, 20.5.5.2 and 20.5.5.3 shall apply only if grab bars are installed.

20.5.5.1 A vertical grab bar shall be provided either [option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 20.5.5.1.1 or [option 2] as a free standing, external pole as specified in 20.5.5.1.2

20.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

20.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

20.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [option 1] as a diagonal grab bar as specified in 20.5.5.2.1 or [option 2] as a horizontal grab bar as specified in 20.5.5.2.2

20.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

20.5.5.2.2 [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

20.5.5.3.1* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 20.5.5.

20.5.5.3.2 Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.
Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.
1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other
health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost and disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA's currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

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Committee Statement

Resolution: The Chapter 11 new grab bar provisions might be appropriate for health care occupancies, but the HEA committee wants to study the implications. The material is presented as a Committee Input (CI) to permit the committee to revisit the subject during Second Draft preparation. See CI-4519-NFPA 5000-2015.
Detailed Justification for Proposals for New Requirements for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code) Chapters, specifically Section —.5 Services, in:

- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:

“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].

Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

- ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

**Features of the Specified Grab Bars.** The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use: X.5.5.1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position; X.5.5.2 Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

**Two Details of Design and Installation.**

(1) Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

**Current Exemplars.** Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the young adult victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

**Comparisons of Three Prominent Dangers.** Grab bars are just as important—for everyone—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—by all users. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.

![Pie chart showing the number of injuries in the USA in 2010](chart.png)

*Nonfatal Injuries* *(ER-treated)*

**in USA in 2010**

- Civilian Fire Injuries
- Bath & Shower Injuries
- Stair-related Injuries

* Sources: NFPA and CPSC/NEISS*
Injury Epidemiology. The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

Ergonomic Perspectives on the Special Dangers of Baths and Showers. What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

Societal Injury Costs. The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. Injury Prevention, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. Injury Prevention, 2008, 14: 329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” Technology and Disability 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation—a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—R. Stirling Ferguson—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling...
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

**Public Policies.** Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitiable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

**Summing Up.** The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.
22 YOM SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.
23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.
40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
21 MOM Ruptured an Ear Drum with a Cotton-Tipped Swab While Bathing in Tub at Home.
48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.
04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR
10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO
80 YOF FELL IN SHOWER AT HOME HIT HEAD DX/ HEAD INJURY
94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR DX/ FACIAL FX
55 YOM SLL LEG HEMATOMA
72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.
22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.
26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN
90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION
30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK
51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC
60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX
44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME DX/ ABDOMINAL CONTUSION
04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE
51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.
33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION
23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.
62 YOM WITH BACK PAIN FELL INTO TUB DX; CONTUSION TO LOWER BACK
63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS
54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX// RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUMPED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOM FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATH BRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
90 YOF SUFFERED A FALL IN THE SHOWER AND SLEPT ONTO BLUNT PART OF BATHTUB, IMMEDIATELY HAD PAIN & TROUBLE BREATHING, DX: MULTIPLE RIB FXS
56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER FACE & INJURING HER RT ARM - DX: MECHANICAL FALL W/ FRACTURE RT SHOULDER
78 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER, SHOULDER INJURY
47 YOF HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED, DX: BLUNT HEAD TRAUMA W/BRIEF LOC
62 YOF HAD A SYNFAL TODAY AT HOME IN THE SHOWER INJURING EYE AREA - DX: LACERATION TO FACE
78 YOF PRESENT TO ER FROM HOME WHEN SHE WAS TAKING A BATH AND COLLAPSED - DX: CARDIAC ARREST, RESUSCITATED
43 YOF PRESENT TO ER AFTER HE WAS IN THE BATHTUB AND SLIP AND FALL GETTING OUT HITTING HEAD ON FLOOR - DX: BLUNT HEAD TRAUMA
81 YOF PRESENT TO ER AFTER A FALL IN THE SHOWER AT HOME TODAY INJURING THE HEAD AREA - DX: BLUNT HEAD TRAUMA
41 YOF FELL OUT OF SHOWER AT ASSISTED LIVING HOME YESTERDAY ONTO RT SIDE C/O RT HIP & RT LEG PAIN, DX: RT HIP FRACTURE
89 YOF TRYING TO GET OUT OF BATHTUB ACCIDENTALLY FELL INJURED LOWER BACK, BACK CONTUSION AND AMBULATORY DYSFUNCTION
92 YOF PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING RT HIP, DX: FRACTURE RT LOWER TRUNK (HIP)
88 YOF PRESENT TO ER AFTER A FALL IN BATH TUB AT SNF INJURING LT HIP, DX: FRACTURE LT LOWER TRUNK (HIP)
88 YOF GETTING OUT OF SHOWER, FELT DIZZY & FELL STRIKING BACK OF HEAD ON FLOOR INJURING LT ARM, DX: SKIN TEAR LACERATION
44 YOF FELL IN SHOWER TODAY SUSTAINING HEAD INJURY, DX: SCALP LACERATION
37 YOF SUSTAINED A MECHANICAL FALL IN SHOWER ONTO RT UPPER EXTREMITY, C/O RT SHOULDER PAIN, DX: RT DISTAL CLAVICLE FX
37 YOF HAD A GROUND LEVEL FALL IN BATHROOM STRIKING LOWER BACK ON BATHTUB, DX: SPINAL CONTUSION
84 YOF HAD SYNFAL EPISODE IN SHOWER AND FELL, DX: L 10TH RIB FX, INABILITY TO AMULATE.
87 YOF FELL IN SHOWER, DX: RHABDOMYOLYSIS.
93 YOF FELL IN SHOWER AT ASSISTED LIVING, DX: L DISTAL HUMERUS FX.
79 YOF FELL IN SHOWER, DX: A FIB W/RAPID VENTRICULAR RESP, SYNCOPE, SDH, SAH, ELEVATED INR.
84 YOF FELL WHILE GETTING OUT OF BATHTUB SUSTAINING A FRACTURE TO HER LUMBAR SPINE
90 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING, DX: R KNEE STRAIN W/POSS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.
82 YOF WITH NO INJ FROM FALL IN TUB
85 YOF WITH NO INJ, FELL IN BATHTUB, ADMITTED FOR OTHER REASONS
52 YOF W/ALS FELL AND BECAME STUCK BETWEEN TOILET AND TUB, DX: RHABDOMYOLYSIS STATUS POST FALL, NASAL FX.
95 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION
71 YOF SLIPPED AND FELL IN SHOWER, DX: SYNCOPE, LARGE HEAD LAC, COAGULOPATHY, HYPOKALEMIA, LONT QT, ALCO
79 YOF FELL IN SHOWER SUSTAINING A FRACTURED KNEE
87 YOF WITH RIB FRACTURE FROM FALL IN TUB
79 YOF WITH LOWER BACK STRAIN FROM FALL IN SHOWER
81 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP
97 YOF FELL IN THE SHOWER AT NURSING HOME, DX: TRAUMATIC SDH, AGITATION.
70 YOF FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP, SUSTAINED CHI, BACK CONTUSIONS
88 YOF FELL AGAINST BATHTUB AND WALK AT ASSISTED LIVING, DX: BACK/SHOUL.PX, SYNCOPE, STAGE I THORACIC DECUBITUS ULCER, MULT OLD THORACIC FXS.
88 YOF SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME, DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.
41 YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED
83 YOF FELL IN THE SHOWER, DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/O LOC, RENAL FAILURE.
94 YOF FELL GETTING OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION
79 YOF FELL ON SIDE OF BATHTUB, DX: SYNCOPE, CHEST WALL CONT.
55 YOF SLIPPED AND FELL IN BATHTUB, DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.
86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ ACUTE DEHYDRATED
95 YOF THREW OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME, DX: AVULSION TO FACE/ MALIGNANT HYPTERTENSION
53 YOF SLIPPED IN SHOWER AND FELL HITTING HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES
Public Input No. 139-NFPA 5000-2015 [ Section No. 22.1.1.2 ]

22.1.1.2

One- and two-family dwellings shall be limited to buildings containing not more than two dwelling units in which each dwelling unit is occupied by members of a single family with not more than three outsiders, if any, accommodated in rented rooms.

Statement of Problem and Substantiation for Public Input

This revision intends to eliminate the attempt to define a family. This should be a zoning or land use issue. Having 3 outsiders renting rooms sounds more like a boarding house.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 18:05:08 EDT 2015

Committee Statement

Resolution: The specified threshold is needed to determine what constitutes a residential occupancy other than a one- and two-family dwelling (e.g., lodging or rooming house).
Public Input No. 140-NFPA 5000-2015 [Section No. 22.1.8.2]

22.1.8.2 –
The requirement of 22.1.8.1 shall not apply to any of the following:

(1) Townhouses
(2) Multiple-occupancy buildings
(3) Additions or alterations to existing one- and two-family dwellings

Statement of Problem and Substantiation for Public Input

This may interfere with compliance with and enforcement of the Fair Housing Act and ADA.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA’s Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 18:07:34 EDT 2015

Committee Statement

Resolution: The submitter’s substantiation does not explain how there are conflicts with the Fair Housing Act or the ADA.
22.2.4.8

Floor levels at doors in the primary means of escape shall comply with 11.2.1.3, unless otherwise permitted by one of the following:

(1) Where the door discharges to the outside or to an exterior exit access, an exterior landing with not more than a 7 in. (180 mm) drop below the door threshold and a minimum dimension of 36 in. (915 mm), or the width of the door leaf, whichever is *smaller* greater, shall be permitted.

(2) A door at the top of an interior stair shall be permitted to open directly at a stair, provided that the door does not swing over the stair and the door serves an area with an occupant load of fewer than 50 persons.

Statement of Problem and Substantiation for Public Input

The minimum should be at least 36 inches in the direction of the door swing before the step.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 18:09:58 EDT 2015

Committee Statement

Resolution: No justification has been provided to require a landing larger than the door width.
22.3.4.1.1 *

Smoke alarms shall be installed in accordance with 55.2.2.6 in all of the following locations:

1. In all sleeping rooms
2. * Outside of each separate sleeping area, in the immediate vicinity of the sleeping rooms and within 21 feet horizontally of any door to a sleeping room.
3. On each level of the dwelling unit, including basements

Statement of Problem and Substantiation for Public Input

This revision takes a vague code requirement and uses the information in the Annex to be more specific.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 18:12:27 EDT 2015

Committee Statement

Resolution: The proposed 21 ft criterion might be excessive in some cases. The existing performance-based language gives the AHJ the latitude to evaluate installations on a case-by-case basis.
Public Input No. 85-NFPA 5000-2015 [Sections 22.3.4.2, 22.3.4.3, 22.3.4.4]

Sections 22.3.4.2, 22.3.4.3, 22.3.4.4

22.3.4.2

Carbon monoxide alarms or carbon monoxide detectors in accordance with 22.3.4.3 and Section 55.11 shall be provided in one- and two-family dwellings where any of the following conditions exists:

(1) Dwelling units with communicating attached garages, unless otherwise exempted by 22.3.4.4
(2) Dwelling units having a separation wall constructed of gypsum wallboard with attached garages, unless otherwise exempted by 22.3.4.2.3
(3) Dwelling units containing fuel-burning appliances or fuel-burning fireplaces

22.3.4.3 *

Where required by 22.3.4.2, carbon monoxide alarms or carbon monoxide detectors shall be installed in the following locations:

(1) Outside of each separate dwelling unit sleeping area in the immediate vicinity of the sleeping rooms
(2) On every occupiable level of the dwelling unit, including basements, but excluding attics and crawl spaces

22.3.4.4

Carbon monoxide alarms and carbon monoxide detectors as specified in 22.3.4.2 (1) shall not be required in the following locations:

(1) Garages
(2) Dwelling units with communicating attached garages that are open parking structures as defined by the building code
(3) Dwelling units with communicating attached garages that are mechanically ventilated in accordance with the mechanical code
(4) Within dwelling units having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined by the building codes
(5) Within dwelling units having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code.

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to protect building occupants from serious injury or possibly death from unintentional, non-fire related carbon monoxide (CO) exposure emanating from attached garages without communicating openings. A recently published Fire Protection Research Foundation (FPRF) report Carbon Monoxide Diffusion Project confirms that CO gas is capable of diffusing through porous walls at a rate that presents a danger to building occupants. The Public Input deletes the term “communicating”.

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In preparing the report the, Imperial College London analyzed data from laboratory experiments and found five reported incidents of CO poisoning. Their analysis confirms the transport of CO through porous walls and the findings merit consideration in current life safety codes.

Submitter Information Verification

Submitter Full Name: VINCE BACLAWSKI
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 13:00:44 EDT 2015

Committee Statement

Resolution: Other construction materials might have similar diffusion properties. The initial research appears to be preliminary and additional information might be forthcoming. The research doesn't address all construction assemblies or combinations of materials.
22.3.4.3 * - 
Where required by 22.3.4.2, carbon monoxide alarms or carbon monoxide detectors shall be installed in the following locations:

1. Outside of each separate dwelling unit sleeping area in the immediate vicinity of the sleeping rooms and within 21 feet horizontally of any door to a sleeping room.
2. On every occupiable level of the dwelling unit, including basements, but excluding attics and crawl spaces.

Statement of Problem and Substantiation for Public Input

This correlates with a Public Input to section 22.3.4.1.1 (2). The distance of 21 ft. is used to correlate with the requirements for smoke alarms when combination smoke alarm/carbon monoxide detector are used.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: Jim Muir  
Organization: Building Safety Division, Clark County, Washington  
Affiliation: NFPA's Building Code Development Committee (BCDC)  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Sat Jul 04 18:16:12 EDT 2015

Committee Statement

Resolution: It is unlikely that the audibility criteria of NFPA 720 within the sleeping room would be met if the proposed distance criterion were utilized.
22.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers

New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 22.5.5.1, 22.5.5.2, and 22.5.5.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 11.1.6.4, the requirements of 22.5.5.1, 22.5.5.2 and 22.5.5.3 shall apply only if grab bars are installed.

22.5.5.1* A vertical grab bar shall be provided either [option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 22.5.5.1.1 or [option 2] as a free standing, external pole as specified in 22.5.5.1.2

22.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

22.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

22.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [option 1] as a diagonal grab bar as specified in 22.5.5.2.1 or [option 2] as a horizontal grab bar as specified in 22.5.5.2.2

22.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

22.5.5.2.2 [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

22.5.5.3* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 22.5.5.

22.5.5.3.1* Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.

Additional Proposed Changes
Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people's movement when accessing and egressing baths/showers.

1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;

2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other...
health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost and disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

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Committee Statement

Resolution: CI-7002-NFPA 5000-2015
Statement: See the substantiation for PI-156.
Detailed Justification for Proposals for New Requirements  
for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code)
Chapters, specifically Section —.5 Services, in:
- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:
“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].
Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

- ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

**Features of the Specified Grab Bars.** The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:

- **X.5.5.1.** Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
- **X.5.5.2.** Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

**Two Details of Design and Installation.**

1. Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

Current Exemplars. Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the young adult victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

Comparisons of Three Prominent Dangers. Grab bars are just as important—for everyone—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—by all users. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.
Injury Epidemiology. The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

Ergonomic Perspectives on the Special Dangers of Baths and Showers. What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

Societal Injury Costs. The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. Injury Prevention, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. Injury Prevention, 2008, 14: 329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” Technology and Disability 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation-a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—*R. Stirling Ferguson*—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

**Public Policies.** Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub/shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

**Summing Up.** The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOF SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FOLED IN THE SHOWER DX: R EAR LAC / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROUTUM FELL IN TUB DX: LACERATION TO SCROUTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX// RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUM PED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOM FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB Hitting FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital

(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
69 YOM WAS WASHING HIMSELF IN SHOWER, FELL ONTO BLUNT PART OF BATHTUB, IMMEDIATELY HAD PAIN & TROUBLE BREATHING. DX: MULTIPLE RIB FXS
56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER FACE & INJURING HER RT ARM - DX: MECHANICAL FALL W/ FRACTURE RT SHOULDER
78 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER;SHOULDER INJURY
47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX: BLUNT HEAD TRAUMA W/BRIEF LOC
62 YOM HAD A SYNCOPE TODAY AT HOME IN THE SHOWER INJURING EYE AREA - DX: LACERATION TO FACE(EYE)
47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX: BLUNT HEAD TRAUMA
78 YOF PRESENT TO ER FROM HOME WHEN SHE WAS TAKING A BATH AND COLLAPSED - DX: CARDIAC ARREST, RESUSCITATED
43 YOM PRESENT TO ER AFTER HE WAS IN THE BATHTUB AND SLIP AND FELL GETTING OUT HITTING HEAD ON FLOOR- DX: BLUNT HEAD TRAUMA
81 YOM PRESENT TO ER AFTER A FALL IN THE SHOWER AT HOME TODAY INJURING THE HEAD AREA- DX: BLUNT HEAD TRAUMA
41 YOM FELL OUT OF SHOWER AT ASSISTED LIVING HOME: YESTERDAY ONTO RT SIDE C/O RT HIP & RT LEG PAIN. DX: RT HIP FRACTURE
89 YOF TRYING TO GET OUT OF BATHTUB ACCIDENTALLY FELL INJURED LOWER BACK; BACK CONTUSION AND AMBULATORY DYSFUNCTION
92 YOM PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING LT HIP-DX: FRACTURE RT LOWER TRUNK (HIP)
88 YOF PRESENT TO ER AFTER A FALL IN BATHTUB AT SNF INJURING LT HIP- DX: FRACTURE LT LOWER TRUNK (HIP)
88 YOF WAS GETTING OUT OF SHOWER, FELT DIZZY & FELL STRIKING BACK OF HEAD ON FLOOR INJURING LT ARM. DX: SKIN TEAR LACERATION
71 YOF WAS FOUND DOWN BY SON IN BATHTUB AT HOME, HAS INJURY TO LT EYE & FOREHEAD, IS REPEETITIVE. DX: BLUNT HEAD TRAUMA, +ETOH
86 YOF LOST BALANCE WHEN SHE TURNED AROUND & FELL INTO BATHTUB C/O LOW BACK PAIN. DX: LOW BACK PAIN, POSS FX VS CONTUSION
80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM STOOD ON THE TOILET, OPENED WIN***, SLIPPED BETWEEN TOILET/TUB;PELVIC FX
44 YOF FELL IN SHOWER TODAY SUSTAINING HEAD INJURY. DX: SCALP LACERATION
37 YOF SUSTAINED A MECHANICAL FALL IN SHOWER ONTO RT UPPER EXTREMITY, C/O RT SHOULDER PAIN. DX: RT DISTAL CLAVICLE FX
37 YOM HAD A GROUND LEVEL FALL IN BATHROOM STRIKING LOWER BACK ON BATHTUB. DX: SPINAL CONTUSION
84 YOF HAD SYNCOPE EPISODE IN SHOWER AND FELL. DX: L 10TH RIB FX, INABILITY TO AMBULATE.
87 YOF FELL IN SHOWER. DX: RHABDOMYOLYSIS.
93 YOF FELL IN SHOWER AT ASSISTED LIVING. DX: L DISTAL HUMERUS FX.
79 YOM FELL IN SHOWER. DX: A FIB W/RAPID VENTRICULAR RESP, SYNCOPE, SDH, SAH, ELEVATED INR.
84 YOF FELL WHILE GETTING OUT OF BATHTUB SUSTAINING A FRACTURE TO HER LUMBAR SPINE
90 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: R KNEE STRAIN W/POSS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.
82 YOF WITH NO INJ FROM FALL IN TUB
85 YOM WITH NO IN, FELL IN BATHTUB, ADMITTED FOR OTHER REASONS
52 YOM W/ALS FELL AND BECAME STUCK BETWEEN TOILET AND TUB. DX: RHABDOMYOLYSIS STATUS POST FALL, NASAL FX.
95 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION
71 YOF SLIPPED AND FELL IN SHOWER. DX: SYNCOPE, LARGE HEAD LAC, COAGULOPATHY, HYPOKALEMIA, LONT QT, ALCO
79 YOF FELL IN SHOWER SUSTAINING A FRACTURED KNEE
87 YOF WITH RIB FRACTURE FROM FALL IN TUB
79 YOM WITH LOWER BACK STRAIN FROM FALL IN SHOWER
81 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP
97 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.
70 YOF FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP. SUSTAINED CHI, BACK CONTUSIONS
88 YOF FELL AGAINST BATHTUB AND WALL AT ASSISTED LIVING. DX: BACK/SHOUL.PX, SYNOPE, STAGE I THORACIC DECUBITUS ULCER, MULT OLD THORACIC FXS.
88 YOF SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.
41 YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED
83 YOM FELL IN THE SHOWER. DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/O LOC, RENAL FAILURE.
94 YOM FELL GETTING OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION
79 YOM FELL ON SIDE OF BATHTUB. DX: SYNOPE, CHEST WALL CONT.
55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.
86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ ACUTE DEHYDRATED
95 YOF TRIPPED OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME DX: AVULSION TO FACE/ MALIGNANT HYPERTENSION
53 YOF SLIPPED IN SHOWER AND FELL HITTING HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES
23.1.3.3 Lodging or rooming houses shall be permitted to be located above a nonresidential occupancy only where one of the following conditions exists:

1. Where the lodging or rooming house and exits therefrom are separated from the nonresidential occupancy by construction having a fire resistance rating of not less than 1 hour.

2. Where the nonresidential occupancy is protected throughout by an approved automatic sprinkler system in accordance with Section 55.3 that is electrically supervised in accordance with 55.3.2.

3. Where a lodging or rooming house is located above a nonresidential occupancy, and the nonresidential occupancy is protected by an automatic fire detection system in accordance with Section 55.2. The general evacuation alarm signal shall operate throughout the entire building in accordance with section 55.2.3.6.

Statement of Problem and Substantiation for Public Input

To make sure the occupancy above the nonresidential occupancy is provided with the alarm notifications for evacuation purposes.

Submitter Information Verification

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Submittal Date: Sat Jul 04 18:19:49 EDT 2015

Committee Statement

Resolution: In mixed occupancies the more restrictive requirements must be met throughout the building.
Public Input No. 86-NFPA 5000-2015 [Sections 23.3.4.6.1, 23.3.4.6.2, 23.3.4.6.3]

Sections 23.3.4.6.1, 23.3.4.6.2, 23.3.4.6.3

23.3.4.6.1
Carbon monoxide alarms or carbon monoxide detectors in accordance with 23.3.4.6 and Section 55.11 shall be provided in lodging or rooming houses where any of the following conditions exists:

(1) Lodging or rooming houses with communicating attached garages, unless otherwise exempted by 23.3.4.6.3

(2) Lodging or rooming houses having a separation wall constructed of gypsum wallboard with attached garages, unless otherwise exempted by 23.3.4.6.3

(3) Lodging or rooming houses containing fuel-burning appliances or fuel-burning fireplaces

23.3.4.6.2
Where required by 23.3.4.6.1, carbon monoxide alarms or carbon monoxide detectors shall be installed in the following locations:

(1) Outside of each separate sleeping area in the immediate vicinity of the sleeping rooms

(2) On every occupiable level, including basements, but excluding attics and crawl spaces

23.3.4.6.3
Carbon monoxide alarms and carbon monoxide detectors as specified in 23.3.4.6.1(1) shall not be required in the following locations:

(1) In garages

(2) Within lodging or rooming houses with communicating attached garages that are open parking structures as defined by the building code

(3) Within lodging or rooming houses with communicating attached garages that are mechanically ventilated in accordance with the mechanical code

(4) Within lodging or rooming houses having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined by the building code

(5) Within lodging or rooming houses having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to protect building occupants from serious injury or possibly death from unintentional, non-fire related carbon monoxide (CO) exposure emanating from attached garages without communicating openings. A recently published Fire Protection Research Foundation (FPRF) report Carbon Monoxide Diffusion Project confirms that CO gas is capable of diffusing through porous walls at a rate that presents a danger to building occupants. The Public Input deletes the term “communicating”.
In preparing the report, Imperial College London analyzed data from laboratory experiments and found five reported incidents of CO poisoning. Their analysis confirms the transport of CO through porous walls and the findings merit consideration in current life safety codes.

Submitter Information Verification

Submitter Full Name: VINCE BACLAWSKI
Organization: NEMA

Committee Statement

Resolution: Other construction materials might have similar diffusion properties. The initial research appears to be preliminary and additional information might be forthcoming. The research doesn't address all construction assemblies or combinations of materials.
Public Input No. 157-NFPA 5000-2015 [New Section after 23.5.3]

23.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers

New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 23.5.5.1, 23.5.5.2, and 23.5.5.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 7/11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 7/11.1.6.4, the requirements of 23.5.5.1, 23.5.5.2 and 23.5.5.3 shall apply only if grab bars are installed.

23.5.5.1 A vertical grab bar shall be provided either [Option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 23.5.5.1.1 or [Option 2] as a free standing, external pole as specified in 23.5.5.1.2

23.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

23.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

23.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [Option 1] as a diagonal grab bar as specified in 23.5.5.2.1 or [Option 2] as a horizontal grab bar as specified in 23.5.5.2.2

23.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

23.5.5.2.2 [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

23.5.5.3 Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 23.5.5.

23.5.5.3.1* Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.
Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.
1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other
health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost sand disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA's currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

Submitter Information Verification

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Committee Statement

Resolution: CI-7003-NFPA 5000-2015
Statement: See the substantiation for PI-157.
Detailed Justification for Proposals for New Requirements for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code) Chapters, specifically Section —.5 Services, in:
- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:
“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].

Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

- ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

**Features of the Specified Grab Bars.** The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:

X.5.5.1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;

X.5.5.2 Moving to or from a crouching or seated position in water—**hence applicable only to bathtubs**—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent these are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

**Two Details of Design and Installation.**

(1) Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a *minimum* clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: **35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.**

**Current Exemplars.** Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the *young adult* victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

**Comparisons of Three Prominent Dangers.** Grab bars are just as important—*for everyone*—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—*by all users*. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.

![Pie chart showing nonfatal injuries in USA in 2010](chart.png)

- **Civilian Fire Injuries**
- **Bath & Shower Injuries**
- **Stair-related Injuries**

* Sources: NFPA and CPSC/NEISS

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**Injury Epidemiology.** The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

**Ergonomic Perspectives on the Special Dangers of Baths and Showers.** What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

**Societal Injury Costs.** The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. *Injury Prevention*, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. *Injury Prevention*, 2008, 14: 329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” *Technology and Disability* 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation-a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—*R. Stirling Ferguson*—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

**Public Policies.** Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

**Summing Up.** The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “*We help save lives and reduce loss with information, knowledge and passion,*” and the full scope of its codes and standards which, while historically developed to address fire safety, are now *not* restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME DX/ RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOFAT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUM PED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOF FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital

(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
90 YOF WAS WASHING HIMSELF IN SHOWER, FELL INTO BLUNT PART OF BATHTUB, IMMEDIATELY HAD PAIN & TROUBLE BREATHING. DX: MULTIPLE RIB FXS
56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER FACE & INJURING HER RT ARM - DX: MECHANICAL FALL W/ FRACTURE RT SHOULDER
78 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER;SHOULDER INJURY
47 YOF HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX: BLUNT HEAD TRAUMA W/BRIEF LOC
62 YOM HAD A SYNCOPAL TODAY AT HOME IN THE SHOWER INJURING EYE AREA - DX: LACERATION TO FACE(EYE)
56 YOF SLIPPED IN BATHTUB AND SLIP AND FELL GETTING OUT Hitting HEAD ON FLOOR- DX: BLUNT HEAD TRAUMA
81 YOM PRESENT TO ER AFTER A FALL IN THE SHOWER AT HOME TODAY INJURING THE HEAD AREA- DX: BLUNT HEAD TRAUMA
41 YOM FELL OUT OF SHOWER AT ASSISTED LIVING HOME YESTERDAY ONTO RT SIDE C/O RT HIP & RT LEG PAIN. DX - RT HIP FRACTURE
80 YOF TRYING TO GET OUT OF BATHTUB ACCIDENTALLY FELL INJURED LOWER BACK; BACK CONTUSION AND AMBULATORY DYSFUNCTION
92 YOM PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING RT HIP-DX: FRACTURE RT LOWER TRUNK (HIP)
88 YOF PRESENT TO ER AFTER A FALL IN BATHTUB AT SNF INJURING LT HIP- DX: FRACTURE LT LOWER TRUNK (HIP)
88 YOF WAS GETTING OUT OF SHOWER, FELT DIZZY & FELL STRIKING BACK OF HEAD ON FLOOR INJURING LT ARM. DX: SKIN TEAR LACERATION
88 YOF GETTING OUT OF BATHTUB THIS MORNING FELL TRIED TO BRACE HERSELF INJURED SHOULDER; SHOULDER FRACTURE
71 YOF WAS FOUND DOWN BY SON IN BATHTUB AT HOME, HAS INJURY TO LT EYE & FOREHEAD, IS REPEETITIVE. DX: BLUNT HEAD TRAUMA, +ETOH
86 YOF LOST BALANCE WHEN SHE TURNED AROUND & FELL INTO BATHTUB C/O LOW BACK PAIN. DX - LOW BACK PAIN, POSS FX VS CONTUSION
80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM STOOD ON THE TOILET, OPENED WIN***, SLIPPED BETWEEN TOILET/TUB;PELVIC FX
44 YOF FELL IN SHOWER TODAY SUSTAINING HEAD INJURY. DX - SCALP LACERATION
37 YOF SUSTAINED A MECHANICAL FALL IN SHOWER ONTO RT UPPER EXTREMIT Y, C/O RT SHOULDER PAIN. DX - RT DISTAL CLAVICLE FX
37 YOM HAD A GROUND LEVEL FALL IN BATHROOM STRIKING LOWER BACK ON BATHTUB. DX - SPINAL CONTUSION
84 YOF HAD SYNCPOL EPISODE IN SHOWER AND FELL. DX: L 10TH RIB FX, INABILITY TO AMBULATE.
87 YOF FELL IN SHOWER. DX: RHABDOMYOSIS.
93 YOF FELL IN SHOWER AT ASSISTED LIVING. DX: L DISTAL HUMERUS FX.
79 YOM FELL IN SHOWER. DX: A FIB W/RAPID VENTRICULAR RESP, SYNCOPE, SDH, SAH, ELEVATED INR.
84 YOF FELL WHILE GETTING OUT OF BATHTUB SUSTAINING A FRACTURE TO HER LUMBAR SPINE
90 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: R KNEE STRAIN W/POSS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.
82 YOF WITH NO INJ FROM FALL IN TUB
85 YOM WITH NO INJ, FELL IN BATHTUB, ADMITTED FOR OTHER REASONS
52 YOM W/ALS FELL AND BECAME STUCK BETWEEN TOILET AND TUB. DX: RHABDOMYOSIS STATUS POST FALL, NASAL FX.
95 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION
71 YOF SLIPPED AND FELL IN SHOWER. DX: SYNCOPE, LARGE HEAD LAC, COAGULOPATHY, HYPOKALEMIA, LONT QT, ALCO
79 YOF FELL IN SHOWER SUSTAINING A FRACTURED KNEE
87 YOF WITH RIB FRACTURE FROM FALL IN TUB
79 YOM WITH LOWER BACK STRAIN FROM FALL IN SHOWER
81 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP
97 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.
70 YOF FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP, SUSTAINED CHI, BACK CONTUSIONS
88 YOF FELL AGAINST BATHTUB AND WALL AT ASSISTED LIVING. DX: BACK/SHOUL,PX, SYNCOPE, STAGE I THORACIC DECUBITUS ULCER, MULT OLD THORACIC FX’S.
88 YOF SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.
41 YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED
83 YOM FELL IN THE SHOWER. DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/O LOC, RENAL FAILURE.
94 YOM FELL GETTING OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION
79 YOM ON SIDE OF BATHTUB. DX: SYNCOPE, CHEST WALL CONT.
55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.
86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ ACUTE DEHYDRATED
95 YOF TRIpped OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME DX: AVULSION TO FACE/ MALIGNANT HYPERTENSION
53 YOF SLIPPED IN SHOWER AND FELL HITTING HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES
24.3.4.3* Notification.

Occupant notification shall meet the following requirements:

(1) Occupant notification shall be provided automatically in accordance with 55.2.3.

(2) Positive alarm sequence in accordance with 55.2.3.4 shall be permitted.

24.3.4.3.1 Mass Notification Risk Analysis. A Risk Analysis in accordance with section 55.2 of this code shall be conducted for new college and university buildings to determine the need for Mass Notification.

24.3.4.3.2 Emergency Response Plan. An emergency response plan shall be developed or modified for each College and University based on requirements of 55.2.

24.3.4.3.2.1 Where there is an emergency response plan in place, Mass Notification shall be implemented in accordance with the Risk Analysis to provide emergency communication required by the emergency response plan.

Statement of Problem and Substantiation for Public Input

This will point to Chapter 4 for instructions. Within College Campus and Universities, dormitories are in this section; this is the reason for this section to point to Chapter 4.

The purpose for this Public Input seeks to provide a requirement that every new College and University Dormitory building conduct a Risk Analysis and create an Emergency Response Plan for their facility. The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security and our educational occupancies. We have learned from the recent incidents that occurred in our college/university campuses and other buildings, and have created installation guidelines to be followed for Life Safety. [Aurora, CO. Theater 2012; Columbine 1999; Virginia Tech 2007; Sandy Hook 2012; Weather Tornadoes/Storms]]

NFPA 72 National Fire Alarm and Signaling Code has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the Risk Analysis and Emergency Response Plan as required in the above proposed sections.

This is NOT intended to require a Mass Notification System in every building. There are many elements contained within a Mass Notification System, the process of the Risk Analysis will outline what is needed based on Risk and engineering study for the occupancy. It will be the responsibility of the building/campus to react to the Risk Assessment.

An Emergency Response Plan will be needed for each College and Universities dormitory.

Submitter Information Verification

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**Committee Statement**

Resolution: CI-7004-NFPA 5000-2015  
Statement: See the substantiation for PI-76.
24.3.4.10 Carbon Monoxide Alarms or Detection Systems.

Carbon monoxide alarms or carbon monoxide detectors in accordance with 24.3.4.10 and Section 55.11 shall be provided in hotels and dormitories where any of the following conditions exists:

1. Guest rooms or guest suites having a communicating attached garage, unless otherwise exempted by 24.3.4.10.2
2. Guest rooms or guest suites containing a permanently installed fuel-burning appliance or fuel-burning fireplace

24.3.4.10.1

Where required by 24.3.4.10, carbon monoxide alarms or carbon monoxide detectors shall be installed as follows:

1. Outside of each separate sleeping area in the immediate vicinity of the sleeping rooms
2. On every occupiable level of a guest room and guest suite

24.3.4.10.2

Carbon monoxide alarms and carbon monoxide detectors as specified in 24.3.4.10(1) shall not be required in the following locations:

1. Garages
2. Guest rooms or guest suites with communicating attached garages that are open parking structures as defined by the building code
3. Guest rooms or guest suites with communicating attached garages that are mechanically ventilated in accordance with the mechanical code

24.3.4.10.3

Where fuel-burning appliances or fuel-burning fireplaces are installed outside guest rooms or guest suites, carbon monoxide alarms or carbon monoxide detectors shall be installed in accordance with the manufacturer’s published instructions in all of the following locations:

1. On. Carbon monoxide detectors shall be installed on the ceilings of rooms containing permanently installed fuel-burning appliances or fuel-burning fireplaces
2. In a centrally. Carbon monoxide detectors shall be installed centrally located position within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system
3. In a centrally. Carbon monoxide detectors shall be installed centrally located position within occupiable spaces adjacent to a communicating attached garage
24.3.4.10.4 Carbon monoxide alarms or carbon monoxide detectors shall be installed in accordance with the manufacturer’s published instructions in all of the following locations:

(1) On Carbon monoxide detectors shall be installed on the ceilings of rooms containing permanently installed fuel-burning appliances

(2) In a centrally Carbon monoxide detectors shall be installed centrally located position within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system

(3) In a centrally Carbon monoxide detectors shall be installed centrally located position within occupiable spaces adjacent to a communicating attached garage

24.3.4.10.5 Where carbon monoxide detectors are installed in accordance with 28.3.4.6.4(1), the alarm signal shall be automatically transmitted to an approved onsite location or to an off-premises location in accordance with NFPA 720.

Statement of Problem and Substantiation for Public Input

This Public Input seeks to make sure the carbon monoxide audible alarm and trouble signal will be heard so that appropriate action will be taken.

The objective of installing carbon monoxide detection/notification devices in occupied spaces is to wake/alert occupants so they can exit the premises. However, installations in furnace or boiler rooms, as is required by 24.3.4.10.3(1) and 24.3.4.10.4(1) should be designed so that a responsible party can take immediate action if a fuel-burning appliance malfunctions, potentially spreading carbon monoxide throughout the occupancy. Such rooms are often not regularly staffed. Therefore, the notification in such installations should sound in a constantly attended location, so that action can be taken quickly.

Submitter Information Verification

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Submittal Date: Thu Jul 02 13:10:57 EDT 2015

Committee Statement

Resolution: The proposed revision does not adequately address the location of on-site notification.
24.3.4.10 Carbon Monoxide Alarms or Detection Systems.

Carbon monoxide alarms or carbon monoxide detectors in accordance with 24.3.4.10 and Section 55.11 shall be provided in hotels and dormitories where any of the following conditions exists:

1. Guest rooms or guest suites having a communicating attached garage, unless otherwise exempted by 24.3.4.10.2

2. Guest rooms or guest suites having a separation wall constructed of gypsum wallboard with attached garages, unless otherwise exempted by 24.3.4.10.2

3. Guest rooms or guest suites containing a permanently installed fuel-burning appliance or fuel-burning fireplace

24.3.4.10.1

Where required by 24.3.4.10, carbon monoxide alarms or carbon monoxide detectors shall be installed as follows:

1. Outside of each separate sleeping area in the immediate vicinity of the sleeping rooms

2. On every occupiable level of a guest room and guest suite

24.3.4.10.2

Carbon monoxide alarms and carbon monoxide detectors as specified in 24.3.4.10(1) shall not be required in the following locations:

1. Garages

2. Guest rooms or guest suites with communicating attached garages that are open parking structures as defined by the building code

3. Guest rooms or guest suites with communicating attached garages that are mechanically ventilated in accordance with the mechanical code

4. Within guest rooms or guest suites having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined by the building code

5. Within guest rooms or guest suites having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code
24.3.4.10.3
Where fuel-burning appliances or fuel-burning fireplaces are installed outside guest rooms or
guest suites, carbon monoxide alarms or carbon monoxide detectors shall be installed in
accordance with the manufacturer’s published instructions in all of the following locations:

(1) On the ceilings of rooms containing permanently installed fuel-burning appliances or
fuel-burning fireplaces

(2) In a centrally located position within occupiable spaces served by the first supply air
register from a permanently installed, fuel-burning HVAC system

(3) In a centrally located position within occupiable spaces adjacent to a communicating
attached garage

(4) Centrally located within occupiable spaces adjacent to an attached garage, with a
separation wall constructed of gypsum wallboard

24.3.4.10.4
Carbon monoxide alarms or carbon monoxide detectors shall be installed in accordance with
the manufacturer’s published instructions in all of the following locations:

(1) On the ceilings of rooms containing permanently installed fuel-burning appliances

(2) In a centrally located position within occupiable spaces served by the first supply air
register from a permanently installed, fuel-burning HVAC system

(3) In a centrally located position within occupiable spaces adjacent to a communicating
attached garage

(4) Centrally located within occupiable spaces adjacent to an attached garage, with a
separation wall constructed of gypsum wallboard

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to protect building occupants from serious injury or possibly
death from unintentional, non-fire related carbon monoxide (CO) exposure emanating from attached
garages without communicating openings. A recently published Fire Protection Research Foundation
(FPRF) report Carbon Monoxide Diffusion Project confirms that CO gas is capable of diffusing through
porous walls at a rate that presents a danger to building occupants. The Public Input deletes the term
“communicating”.

In preparing the report, Imperial College London analyzed data from laboratory experiments and
found five reported incidents of CO poisoning. Their analysis confirms the transport of CO through
porous walls and the findings merit consideration in current life safety codes.

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Submittal Date: Thu Jul 02 13:17:43 EDT 2015
| Resolution: Other construction materials might have similar diffusion properties. The initial research appears to be preliminary and additional information might be forthcoming. The research doesn't address all construction assemblies or combinations of materials. |
24.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers

New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 24.5.5.1, 24.5.5.2, and 24.5.5.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 11.1.6.4, the requirements of 24.5.5.1, 24.5.5.2 and 24.5.5.3 shall apply only if grab bars are installed.

24.5.5.1 A vertical grab bar shall be provided either [option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 24.5.5.1.1 or [option 2] as a free standing, external pole as specified in 24.5.5.1.2

24.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

24.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

24.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [Option 1] as a diagonal grab bar as specified in 24.5.5.2.1 or [Option 2] as a horizontal grab bar as specified in 24.5.5.2.2

24.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

24.5.5.2.2 [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

24.5.5.3* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 24.5.5.

24.5.5.3.1* Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.
Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.
1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other

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health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost sand disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA's currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

Submitter Information Verification

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Submittal Date: Sun Jul 05 13:54:50 EDT 2015

Committee Statement

Resolution: FR-7005-NFPA 5000-2015
Statement: See the substantiation for PI-158.
Detailed Justification for Proposals for New Requirements
for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code) Chapters, specifically Section .5 Services, in:
- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:

“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].

Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

- ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

**Features of the Specified Grab Bars.** The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:

X.5.5.1 Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
X.5.5.2 Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

**Two Details of Design and Installation.**

1. Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

**Current Exemplars.** Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the young adult victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

**Comparisons of Three Prominent Dangers.** Grab bars are just as important—for everyone—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—by all users. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.

![Pie chart showing nonfatal injuries in US in 2010](chart.png)

*Nonfatal Injuries* *(ER-treated)*  
**in USA in 2010**

- Civilian Fire Injuries
- Bath & Shower Injuries
- Stair-related Injuries

*Sources: NFPA and CPSC/NEISS*
Injury Epidemiology. The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

Ergonomic Perspectives on the Special Dangers of Baths and Showers. What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

Societal Injury Costs. The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. Injury Prevention, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,500 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. Injury Prevention, 2008, 14:329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” Technology and Disability 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation-a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—R. Stirling Ferguson—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

**Public Policies.** Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

- 4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

**Summing Up.** The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “*We help save lives and reduce loss with information, knowledge and passion,*” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment

(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

41 YOM FRACUTED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
18 YOF SPRAINED HER LOWER BACK BY FALLING IN THE SHOWER AT SCHOOL.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.
22 YOM SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.
23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.
40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
21 MOM RUPTURED AN EAR DRUM WITH A COTTON-TIPPED SWAB WHILE BATHING IN TUB AT HOME.
48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.
04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR
10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO
80 YOF FELL IN SHOWER AT HOME HIT HEAD DX/ HEAD INJURY
94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR DX/ FACIAL FX
55 YOM SLL LEG HEMATOMA
72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.
22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.
26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN
90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION
30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK
51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC
60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX
44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME DX/ ABDOMINAL CONTUSION
04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE
51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.
33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION
23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.
62 YOM WITH BACK PAIN FELL INTO TUB DX: CONTUSION TO LOWER BACK
63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS
54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX/ RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUM PED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOF FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATHTUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB Hitting FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION

69 YOM WAS WASHING HIMSELF IN SHOWER, FELL ONTO BLUNT PART OF BATHTUB, IMMEDIATELY HAD PAIN & TROUBLE BREATHING. DX - MULTIPLE RIB FXS

56 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER FACE & INJURING HER RT ARM - DX: MECHANICAL FALL W/ FRACTURE RT SHOULDER

78 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER;SHOULDER INJURY

47 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX - BLUNT HEAD TRAUMA W/BRIEF LOC

62 YOM HAD A SYNCOPAL TODAY AT HOME IN THE SHOWER INJURING EYE AREA- DX - LACERATION TO FACE( EYE)

78 YOF PRESENT TO ER FROM HOME WHEN SHE WAS TAKING A BATH AND COLLAPSED - DX: CARDIAC ARREST, RESUSCITAED

43 YOM PRESENT TO ER AFTER HE WAS IN THE BATHTUB AND SLIP AND FELL GETTING OUT HITTING HEAD ON FLOOR- DX: BLUNT HEAD TRAUMA

81 YOM PRESENT TO ER AFTER A FALL IN THE SHOWER AT HOME TODAY INJURING THE HEAD AREA- DX: BLUNT HEAD TRAUMA

41 YOM FELL OUT OF SHOWER AT ASSISTED LIVING HOME YESTERDAY ONTO RT SIDE C/O RT HIP & RT LEG PAIN. DX - RT HIP FRACTURE

80 YOF TRYING TO GET OUT OF BATHTUB ACCIDENTALLY FELL INJURED LOWER BACK; BACK CONTUSION AND AMBULATORY DYSFUNCTION

92 YOM PRESENT TO ER AFTER A FALL IN BATHTUB THIS MORNING INJURING RT HIP-DX- FRACTURE RT LOWER TRUNK (HIP)

88 YOF PRESENT TO ER AFTER A FALL IN BATH TUB AT SNF INJURING LT ARM. DX - SKIN TEAR LACERATION

88 YOF GETTING OUT OF BATHTUB THIS MORNING FELL TRIED TO BRACE HERSELF INJURED SHOULDER; SHOULDER FRACTURE

71 YOF WAS FOUND DOWN BY SON IN BATHTUB AT HOME, HAS INJURY TO LT EYE & FOREHEAD, IS REPETITIVE. DX - BLUNT HEAD TRAUMA, +ETOH

86 YOF LOST BALANCE WHEN SHE TURNED AROUND & FELL INTO BATHTUB C/O LOW BACK PAIN. DX - LOW BACK PAIN, POSS FX VS CONTUSION

80 YOF HUSBAND DID NOT WANT HER SMOKING IN THE HOUSE, WENT TO BATHROOM STOOD ON THE TOILET, OPENED WIN***, SLIPPED BETWEEN TOILET/TUB;PELVIC FX

44 YOF FELL IN SHOWER TODAY SUSTAINING HEAD INJURY. DX - SCALP LACERATION

37 YOF SUSTAINED A MECHANICAL FALL IN SHOWER ONTO RT UPPER EXTREMITY, C/O RT SHOULDER PAIN. DX - RT DISTAL CLAVICLE FX

37 YOM HAD A GROUND LEVEL FALL IN BATHROOM STRIKING LOWER BACK ON BATHTUB. DX - SPINAL CONTUSION

84 YOF HAD SYNCOPAL EPISODE IN SHOWER AND FELL. DX: L 10TH RIB FX, INABILITY TO AMBULATE.

87 YOF FELL IN SHOWER. DX: RHABDOMYOLYSIS.

93 YOF FELL IN SHOWER AT ASSISTED LIVING. DX: L DISTAL HUMERUS FX.

79 YOM FELL IN SHOWER. DX: A FIB W/RAPID VENTRICULAR RESP, SYCNOPE, SDH, SAH, ELEVATED INR.

84 YOF FELL WHILE GETTING OUT OF BATHTUB SUSTAINING A FRACTURE TO HER LUMBAR SPINE

90 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: KNEE STRAIN W/POSS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.

82 YOF WITH NO INJ FROM FALL IN TUB

85 YOM WITH NO INJ, FELL IN BATHTUB, ADMITTED FOR OTHER REASONS

52 YOM W/ALS FELL AND BECAME STUCK BETWEEN TOILET AND TUB. DX: RHABDOMYOLYSIS STATUS POST FALL, NASAL FX.

95 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION

71 YOF SLIPPED AND FELL IN SHOWER. DX: SYCNOPE, LARGE HEAD LAC, COAGULOPATHY, HYPOKALEMIA, LONT QT, ALCO

79 YOF FELL IN SHOWER SUSTAINING A FRACTURED KNEE

87 YOF WITH RIB FRACTURE FROM FALL IN TUB

79 YOM WITH LOWER BACK STRAIN FROM FALL IN SHOWER

81 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP

97 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.

70 YOF FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP, SUSTAINED CHI, BACK CONTUSIONS

88 YOF FELL AGAINST BATHTUB AND WALL AT ASSISTED LIVING. DX: BACK/SHOUL.PX, SYCNOPE, STAGE I THORACIC DECUBITUS ULCER, MULT OLD THORACIC FX'S.

88 YOF SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.

41 YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED

83 YOM FELL IN THE SHOWER. DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/LOC, RENAL FAILURE.

94 YOM FELL GETTING OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION

79 YOM FALL ON SIDE OF BATHTUB. DX: SYCNOPE, CHEST WALL CONT.

55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.

86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ ACUTE DEHYDRATED

95 YOF TRIPPED OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME DX: AVULSION TO FACE/ MALIGNANT HYPERTENSION

53 YOM SLIPPED IN SHOWER AND FELL Hitting HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES
Public Input No. 89-NFPA 5000-2015 [ Section No. 25.3.4.4 ]

25.3.4.4 Detection. (Reserved)

25.3.4.4.1 Automatic smoke detection in accordance with Section 9.6 shall be provided in each electrical, transformer and telephone equipment room.

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to protect building occupants from serious injury or possibly death and prevent property damage from fires starting in electrical distribution/lighting rooms. According to a 2013 NFPA Report U.S. Home Structure Fires by Marty Ahrens:

- A total of 410 fatalities occur each year
- 260 deaths and $1.0 billion in property damage resulted from the fire spreading beyond the room of origin
- 60 deaths and $131 million in property damage originated from electrical distribution equipment

Both automatic smoke detection and automatic sprinkler protection is needed in electrical, transformer and telephone equipment rooms to provide building occupants with the maximum amount of escape time during a fire. According to a United States Fire Administration (USFA) Position Paper, fire deaths are significantly reduced when fire sprinklers and smoke alarms are installed:

1. When fire sprinklers alone are installed, the chances of dying in a fire are reduced by 69 percent when compared to residences without sprinklers.
2. When smoke alarms alone are installed, a reduction in the death rate of 63 percent can be expected when compared to residences without smoke alarms.
3. When both smoke alarms and fire sprinklers are installed, the risk of dying in a fire is reduced by 82 percent when compared to a residence without either

Furthermore according to a 2010 University of Maryland Report Performance of Smoke Detectors and Sprinklers in Residential and Health-Care Occupancies smoke detectors respond prior to residential or ordinary sprinklers and thus have the capability of providing the earliest warning of a fire to building occupants. While responding later, sprinklers provide the additional function of fire suppression to limit the development of hazardous conditions.

Submitter Information Verification

Submitter Full Name: VINCE BACLAWSKI
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 13:26:01 EDT 2015
<table>
<thead>
<tr>
<th>Committee Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution:</strong> It appears the majority of reported fire deaths occurred in nonsprinklered buildings. All new apartment buildings are required to be sprinklered. The substantiation does not support the proposed requirement.</td>
</tr>
</tbody>
</table>
25.3.4.6 Carbon Monoxide Alarms or Detection Systems.

Carbon monoxide alarms or carbon monoxide detectors in accordance with 25.3.4.6 and Section 55.11 shall be provided in apartment buildings where any of the following conditions exists:

1. Dwelling units having a communicating attached garage, unless otherwise exempted by 25.3.4.6.2
2. Dwelling units having a separation wall constructed of gypsum wallboard with attached garages, unless otherwise exempted by 25.3.4.6.2
3. Dwelling units containing a permanently installed fuel-burning appliance or fuel-burning fireplace

25.3.4.6.1

Where required by 25.3.4.6, carbon monoxide alarms or carbon monoxide detectors shall be installed within dwelling units in the following locations:

1. Outside of each separate sleeping area in the immediate vicinity of the sleeping rooms
2. On every occupiable level of a dwelling unit

25.3.4.6.2

Carbon monoxide alarms and carbon monoxide detectors as specified in 25.3.4.6.1(1) shall not be required in the following locations:

1. Garages
2. Dwelling units with communicating attached garages that are open parking structures as defined by the building code
3. Dwelling units with communicating attached garages that are mechanically ventilated in accordance with the mechanical code
4. Within dwelling units having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined by the building code
5. Within dwelling units having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code
25.3.4.6.3

Where fuel-burning appliances or fuel burning fireplaces are installed outside dwelling units, carbon monoxide alarms or carbon monoxide detectors shall be installed in accordance with the manufacturer's published instructions in all of the following locations:

1. On the ceilings of rooms containing permanently installed fuel-burning appliances or fuel-burning fireplaces
2. In a centrally located position within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system
3. In a centrally located position within occupiable spaces adjacent to a communicating attached garage
4. Centrally located within occupiable spaces adjacent to an attached garage with a separation wall constructed of gypsum wallboard

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to protect building occupants from serious injury or possibly death from unintentional, non-fire related carbon monoxide (CO) exposure emanating from attached garages without communicating openings. A recently published Fire Protection Research Foundation (FPRF) report Carbon Monoxide Diffusion Project confirms that CO gas is capable of diffusing through porous walls at a rate that presents a danger to building occupants. The Public Input deletes the term "communicating".

In preparing the report, Imperial College London analyzed data from laboratory experiments and found five reported incidents of CO poisoning. Their analysis confirms the transport of CO through porous walls and the findings merit consideration in current life safety codes.

Submitter Information Verification

Submitter Full Name: VINCE BACLAWSKI
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 13:32:12 EDT 2015

Committee Statement

Resolution: Other construction materials might have similar diffusion properties. The initial research appears to be preliminary and additional information might be forthcoming. The research doesn't address all construction assemblies or combinations of materials.
25.3.4.6.3  Where fuel-burning appliances or fuel burning fireplaces are installed outside dwelling units, carbon monoxide alarms or carbon monoxide detectors shall be installed in accordance with the manufacturer's published instructions in all of the following locations:

1. Carbon monoxide detectors shall be installed on the ceilings of rooms containing permanently installed fuel-burning appliances or fuel-burning fireplaces.

2. Carbon monoxide detectors shall be installed centrally located position within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system.

3. Carbon monoxide detectors shall be installed centrally located position within occupiable spaces adjacent to a communicating attached garage.

25.3.4.6.4  Where carbon monoxide detectors are installed in accordance with 28.3.4.6.4(1), the alarm signal shall be automatically transmitted to an approved onsite location or to an off-premises location in accordance with NFPA 720.

Statement of Problem and Substantiation for Public Input

This Public Input seeks to make sure the carbon monoxide audible alarm and trouble signal will be heard so that appropriate action will be taken.

The objective of installing carbon monoxide detection/notification devices in occupied spaces is to wake/alert occupants so they can exit the premises. However, installations in furnace or boiler rooms, as is required by 25.3.4.6.3(1) should be designed so that a responsible party can take immediate action if a fuel-burning appliance malfunctions, potentially spreading carbon monoxide throughout the occupancy. Such rooms are often not regularly staffed. Therefore, the notification in such installations should sound in a constantly attended location, so that action can be taken quickly.

Submitter Information Verification

Submitter Full Name: VINCE BACLAWSKI  
Organization: NEMA 
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Thu Jul 02 13:28:22 EDT 2015
Resolution: The proposed revision does not adequately address the location of on-site notification.
25.3.5.3
Where an automatic sprinkler system is installed, either for total or partial building coverage, the system shall be installed in accordance with Section 55.3, as modified by 25.3.5.4 through 25.3.5.7. In buildings four or fewer stories in height in buildings not exceeding 60 ft in height above grade plane, systems in accordance with NFPA 13R shall be permitted.

Statement of Problem and Substantiation for Public Input

Intent of the code proposal is to correlate the revised wording in the 2013 NFPA 13R under its Scope 1.1 with NFPA Codes that reference NFPA 13R.

The 2015 IBC did this correlation under its revision of Section 903.3.1.2.

Correlation of the IBC, NFPA 101 and NFPA 5000 with the scope of NFPA 13R will make this codes user friendly and will not leave room for misinterpretation of the requirements for application of NFPA 13R.

2013 NFPA 13R revised Section 1.1 states:
"1.1 Scope. This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height in buildings not exceeding 60 ft (18 m) in height above grade plane."

Submitter Information Verification

Submitter Full Name: Marshall Klein
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Mar 04 17:54:33 EST 2015

Committee Statement

Resolution: FR-7006-NFPA 5000-2015
Statement: Intent of the code proposal is to correlate the revised wording in the 2013 NFPA 13R under its Scope 1.1 with NFPA Codes that reference NFPA 13R.

The 2015 IBC did this correlation under its revision of Section 903.3.1.2.

Correlation of the IBC, NFPA 101 and NFPA 5000 with the scope of NFPA 13R will make this codes user friendly and will not leave room for misinterpretation of the requirements for application of NFPA 13R.
2013 NFPA 13R revised Section 1.1 states:

"1.1 Scope. This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height in buildings not exceeding 60 ft (18 m) in height above grade plane."
25.5.5* Grab Bars for Bathtubs, Bathtub-Shower Combinations and Showers. New
bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided
with grab bars complying with 25.5.5.1, 25.5.5.2, and 25.5.5.3 with all dimensions referring to
the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not
expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and
if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in
11.1.6.4, the requirements of 25.5.5.1, 25.5.5.2 and 25.5.5.3 shall apply only if grab bars are
installed.

25.5.5.1 A vertical grab bar shall be provided either [option 1] installed on the control end wall
of the bathtub, bathtub-shower combination and shower as specified in 25.5.5.1.1 or [option 2]
as a free standing, external pole as specified in 25.5.5.1.2

25.5.5.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its
lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be
installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower
combination and shower unit. The grab bar shall be located at least 6 inches (150 mm),
measured horizontally, from any shower curtain rod fixing point on the wall.

25.5.5.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling
or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or
shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the
bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured
horizontally, of the vertical plane of the control end wall if there is such a wall.

25.5.5.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a
grab bar shall be provided on the back wall either [option 1] as a diagonal grab bar as specified
in 25.5.5.2.1 or [option 2] as a horizontal grab bar as specified in 25.5.5.2.2

25.5.5.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum
length of 24 inches (600 mm) with its higher end placed closer to the control end wall and
located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27
inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall
be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to
30 inch (710 to 760 mm) from the control end wall.

25.5.5.2.2* [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to
10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches
(305 mm) from the control end wall and the other end located a maximum of 24 inches (610
mm) from the opposite or head end of the bathtub.

25.5.5.3* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches
(32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall
provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance
dimensions shall be provided for at least the height requirements and the minimum length
requirements of 25.5.5.

25.5.5.3.2* Grab bars shall be designed and constructed to the structural loading conditions in
Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.
Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.
1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use (and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other...
health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost sand disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA's currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

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Committee Statement

Resolution: FR-7007-NFPA 5000-2015
Statement: See the substantiation for PI-159.
Detailed Justification for Proposals for New Requirements
for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code)
Chapters, specifically Section —.5 Services, in:
• NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
• NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
• NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
• NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
• NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
• NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
• NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
• NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:
“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].
Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:

- ambulation (stepping behavior) traversing elevation changes exceeding 0.5 inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of 0.5-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

**Features of the Specified Grab Bars.** The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:

- **X.5.5.1.** Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
- **X.5.5.2.** Moving to or from a crouching or seated position in water—*hence applicable only to bathtubs*—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

**Two Details of Design and Installation.**

1. Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

Current Exemplars. Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the young adult victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

Comparisons of Three Prominent Dangers. Grab bars are just as important—for everyone—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—by all users. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.
**Injury Epidemiology.** The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short narratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

**Ergonomic Perspectives on the Special Dangers of Baths and Showers.** What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

**Societal Injury Costs.** The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. Injury Prevention, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

Literature Resources. There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. Injury Prevention, 2008, 14:329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” Technology and Disability 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation-a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

Collaborative Efforts Employed. In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—R. Stirling Ferguson—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

Public Policies. Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visitable dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)
41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
18 YOF SPRAINED HER LOWER BACK BY FALLING IN THE SHOWER AT SCHOOL.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.
22 YOM SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.
23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.
40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
21 MOM RUPTURED AN EAR DRUM WITH A COTTON-TIPPED SWAB WHILE BATHING IN TUB AT HOME.
48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.
04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR
10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO
80 YOF FELL IN SHOWER AT HOME HIT HEAD  DX/ HEAD INJURY
94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR  DX/ FACIAL FX
55 YOM SLL LEG HEMATOMA
72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.
22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.
26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN
90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION
30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK
51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC
60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX
44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME  DX/ ABDOMINAL CONTUSION
04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE
51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.
33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION
23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.
62 YOM WITH BACK PAIN FELL INTO TUB DX; CONTUSION TO LOWER BACK
63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS
54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDOR CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX// RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOM SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUM PED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOM FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULDER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital

(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION

90 YOF TURNED IN SHOWER AND FELL SUSTAINING A FRACTURED HIP

91 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.

92 YOM FELL IN SHOWER AT HOME AND WAS UNABLE TO GET UP. SUSTAINED CHI, BACK CONTUSIONS

93 YOF FELL IN SHOWER SUSTAINING CHEST CONTUSION

94 YOM FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER; SHOULDER INJURY

95 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX: BLUNT HEAD TRAUMA W/BRIEF LOC

96 YOM HAD A SYNCOPAL TODAY AT HOME IN THE SHOWER INJURING EYE AREA - DX: LACERATION TO FACE (EYE)

97 YOF SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.

31 YOM FELL AGAINST BATHTUB AND WALL AT ASSISTED LIVING. DX: RIB FRACTURE, PNEUMOTHORAX, MULT R RIB FXS.

55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.

86 YOF FELL BACKWARDS INTO BATHTUB & HIT HEAD AT HOME DX: LACERATION TO SCALP/ACUTE DEHYDRATED

41 YOF WITH NO INJURIES FROM FALL IN SHOWER, WAS ADMITTED

83 YOM FELL IN THE SHOWER. DX: TRAUMATIC ICH, FACIAL LAC, CONCUSSION W/O LOC, RENAL FAILURE.

84 YOM SLIPPED ON WET FLOOR GETTING OUT OF SHOWER AT NURSING HOME. DX: BACK CONT, PNEUMONIA, HYPOXEMIA, PLEURAL EFFUSION.

94 YOM FELL OUT OF THE SHOWER AND HIT HEAD SUSTAINING A LACERATION

95 YOM SLIPPED IN SHOWER AND FELL Hitting HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/UNCONTROLABE DIABETES

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26.2.3.4.6 Carbon Monoxide Detection

26.2.3.4.6.1 Carbon monoxide alarms or carbon monoxide detectors in accordance with section 9.12, 26.2.3.4.6.2 and 26.2.3.4.6.4 shall be provided in new residential board and care occupancies where any of the following conditions exist:

1. Sleeping rooms or sleeping areas with communicating attached garages unless otherwise exempted by 26.2.3.4.6.3

2. Sleeping rooms or sleeping areas with communicating attached garages with a separation wall constructed of gypsum wallboard unless otherwise exempted by 26.2.3.4.6.3

3. Sleeping rooms or sleeping areas with containing fuel-burning appliances or fuel-burning fireplaces

26.2.3.4.6.2 Where required by 26.2.3.4.6.1, carbon monoxide alarms or carbon monoxide detectors shall be installed outside of each separate sleeping room or sleeping area in the immediate vicinity of the sleeping rooms.

26.2.3.4.6.3 Carbon monoxide alarms and carbon monoxide detectors as specified in 26.2.3.4.6.1 (1) and 26.2.3.4.6.1 (2) shall not be required in the following locations:

1. In garages

2. Within sleeping rooms or sleeping areas with communicating attached garages that are open parking structures as defined by NFPA 5000.

3. Within sleeping rooms or sleeping areas with communicating attached garages that are mechanically ventilated in accordance with NFPA 88A.

4. Within sleeping rooms or sleeping areas having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined by the building code.

5. Within sleeping rooms or sleeping areas having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code.

26.2.3.4.6.4 Where fuel-burning appliances or fuel-burning fireplaces are installed outside sleeping rooms or sleeping areas, carbon monoxide detectors shall be installed in accordance with the manufacturer’s published instructions in the locations specified as follows:

1. On the ceilings of rooms containing permanently installed fuel-burning appliances or fuel-burning fireplaces

2. Centrally located within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system

3. Centrally located within occupiable spaces adjacent to an attached communicating garage

4. Centrally located within occupiable spaces adjacent to an attached garage with a separation wall constructed of gypsum drywall.
26.3.3.4.9. Carbon Monoxide Detection

26.3.3.4.9.1. Carbon monoxide alarms or carbon monoxide detectors in accordance with section 9.12, 26.3.3.4.9.2 and 26.3.3.4.9.4 shall be provided in new residential board and care occupancies where any of the following conditions exist:

1. Sleeping rooms or sleeping areas with communicating attached garages unless otherwise exempted by 26.3.3.4.9.3

2. Sleeping rooms or sleeping areas with communicating attached garages with a separation wall constructed of gypsum wallboard unless otherwise exempted by 26.3.3.4.9.3

3. Sleeping rooms or sleeping areas with containing fuel-burning appliances or fuel-burning fireplaces

26.3.3.4.9.2. Where required by 26.3.3.4.9.1, carbon monoxide alarms or carbon monoxide detectors shall be installed outside of each separate sleeping room or sleeping area in the immediate vicinity of the sleeping rooms.

26.3.3.4.9.3. Carbon monoxide alarms and carbon monoxide detectors as specified in 26.3.3.4.9.1(1) and 26.3.3.4.9.1(2) shall not be required in the following locations:

1. In garages

2. Within sleeping rooms or sleeping areas with communicating attached garages that are open parking structures as defined by NFPA 5000.

3. Within sleeping rooms or sleeping areas with communicating attached garages that are mechanically ventilated in accordance with NFPA 88A.

4. Within sleeping rooms or sleeping areas having a separation wall constructed of gypsum wallboard with attached garages that are open parking structures as defined by the building code.

5. Within sleeping rooms or sleeping areas having a separation wall constructed of gypsum wallboard with attached garages that are mechanically ventilated in accordance with the mechanical code.

26.3.3.4.9.4. Where fuel-burning appliances or fuel-burning fireplaces are installed outside dwelling units or patient care sleeping areas, carbon monoxide detectors shall be installed in accordance with the manufacturer’s published instructions in the locations specified as follows:

1. On the ceilings of rooms containing permanently installed fuel-burning appliances or fuel-burning fireplaces

2. Centrally located within occupiable spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system

3. Centrally located within occupiable spaces adjacent to an attached communicating garage

4. Centrally located within occupiable spaces adjacent to an attached garage with a separation wall constructed of gypsum drywall.

Statement of Problem and Substantiation for Public Input

This Public Input seeks to protect both occupants sleeping in, as well as those employed in board and care occupancies from serious injury or possible death from unintentional non-fire related carbon monoxide (CO) exposure by mandating the installation of carbon monoxide detection. This Public Input will harmonize the board and care chapters with International Building Code (IBC) and the International Fire Code (IFC).
Currently over 40 states and/or municipalities have enacted legislation requiring CO detection. CO is a toxic gas which is virtually impossible to detect without an electronic sensing device. It is colorless, tasteless and is unable to be smelled or seen by humans. CO is caused by incomplete burning of fuel such as coal natural gas and propane. The Center of Disease Control (CDC) reports 408 deaths and 20k injuries are caused by CO per year, with 64% in residential homes and 21% in public occupancies. The use of carbon monoxide detection has been standardized by the National Fire Protection Association. NFPA 720-2015 mandates the Installation, testing and maintenance of carbon monoxide detection for both residential as well as commercial applications.

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Committee Statement

Resolution: FR-511-NFPA 5000-2015
Statement: The revision adds requirements for CO detection in new, small board and care facilities in response to direction from the correlating committee, modeled on the CO requirements for lodging or rooming houses in Ch. 23.
26.2.3.5.2.1

In buildings four or fewer stories in height in buildings not exceeding 60 ft in height above grade plane, systems in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, shall be permitted. All habitable areas, closets, roofed porches, roofed decks, and roofed balconies shall be sprinklered.

Statement of Problem and Substantiation for Public Input

Intent of the code proposal is to correlate the revised wording in the 2013 NFPA 13R under its Scope 1.1 with NFPA Codes that reference NFPA 13R.

The 2015 IBC did this correlation under its revision of Section 903.3.1.2.

Correlation of the IBC and NFPA 5000 with the scope of NFPA 13R will make this codes user friendly and will not leave room for misinterpretation of the requirements for application of NFPA 13R.

2013 NFPA 13R revised Section 1.1 states:
"1.1 Scope. This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height in buildings not exceeding 60 ft (18 m) in height above grade plane."

Submitter Information Verification

Submitter Full Name: Marshall Klein
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Submittal Date: Wed Mar 04 17:59:49 EST 2015

Committee Statement

Resolution: FR-505-NFPA 5000-2015
Statement: Intent of the code proposal is to correlate the revised wording in the 2013 NFPA 13R under its Scope 1.1 with NFPA Codes that reference NFPA 13R.

The 2015 IBC did this correlation under its revision of Section 903.3.1.2.

Correlation of the IBC and NFPA 5000 with the scope of NFPA 13R will make this codes user friendly and will not leave room for misinterpretation of the requirements for application of NFPA 13R.

2013 NFPA 13R revised Section 1.1 states:
"1.1 Scope. This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in residential occupancies up to and including four stories in height in buildings not exceeding 60 ft (18 m) in height above grade plane."
Public Input No. 160-NFPA 5000-2015 [ New Section after 26.2.5.3 ]

TITLE OF NEW CONTENT

[ NOTE: This Public Input is to also make the same set of changes as shown here, including Annex Notes, for Large Facilities, in a new Section 26.3.5.4. ]

26.2.5.4* Grab Bars for Baths, Bathtub-Shower Combinations and Showers. New bathtubs, bathtub-shower combinations and showers, for use by occupants, shall be provided with grab bars complying with 26.2.5.4.1, 26.2.5.4.2, and 26.2.5.4.3 with all dimensions referring to the centerline of the grab bar unless otherwise stipulated. If a dedicated shower does not expose users to changes in elevation exceeding 0.5 inch (13 mm), as described in 11.1.6.2, and if it provides slip resistance for all surfaces when wet, as a foreseeable condition described in 11.1.6.4, the requirements of 26.2.5.4.1, 26.2.5.4.2 and 26.2.5.4.3 shall apply only if grab bars are installed.

26.2.5.4.1 A vertical grab bar shall be provided either [Option 1] installed on the control end wall of the bathtub, bathtub-shower combination and shower as specified in 26.2.5.4.1.1 or [Option 2] as a free standing, external pole as specified in 26.2.5.4.1.2

26.2.5.4.1.1* [Option 1] A vertical grab bar, with a minimum length of 24 inches (610 mm), and its lower end between 36 and 39 inches (915 and 990 mm) above the finished floor, shall be installed on the entry/egress side of the control end wall of the bathtub, bathtub-shower combination and shower unit. The grab bar shall be located at least 6 inches (150 mm), measured horizontally, from any shower curtain rod fixing point on the wall.

26.2.5.4.1.2* [Option 2] A vertical pole-type grab bar fixed to the floor and either the room ceiling or an adjacent wall shall be installed outside of the bathtub, bathtub-shower combination or shower unit within 6 inches (150 mm), measured horizontally, outside of the outer edge of the bathtub, bathtub-shower combination or shower and within 30 inches (760 mm), measured horizontally, of the vertical plane of the control end wall if there is such a wall.

26.2.5.4.2 For bathtubs and bathtub-shower combinations bounded on three sides by walls, a grab bar shall be provided on the back wall either [Option 1] as a diagonal grab bar as specified in 26.2.5.4.2.1 or [Option 2] as a horizontal grab bar as specified in 26.2.5.4.2.2

26.2.5.4.2.1* [Option 1] A diagonal grab bar shall be installed on the back wall with a minimum length of 24 inches (600 mm) with its higher end placed closer to the control end wall and located a maximum of 12 inches (305 mm) from the control end wall, with a height of 25 to 27 inches (635 to 685 mm) above rim of the bathtub. The lower end of the diagonal grab bar shall be located at a height of 8 to 10 inches (205 to 255 mm) above the rim of the bathtub and 28 to 30 inches (710 to 760 mm) from the control end wall.

26.2.5.4.2.2* [Option 2] A horizontal grab bar shall be installed on the back wall at a height of 8 to 10 inches (205 to 255 mm) above the bathtub rim with one end located a maximum of 12 inches (305 mm) from the control end wall and the other end located a maximum of 24 inches (610 mm) from the opposite or head end of the bathtub.

26.2.5.4.3* Grab bars shall be circular in cross section with a minimum diameter of 1.25 inches (32 mm) and a maximum diameter of 2 inches (51 mm). If, attached to a wall, the grab bar shall provide a minimum clearance, for hand grasp, of 1.5 inches (38 mm). These size and clearance dimensions shall be provided for at least the height requirements and the minimum length requirements of 26.2.5.4.

26.2.5.4.3.1* Grab bars shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7 as stipulated in Section 35.6.5.1.
Additional Proposed Changes

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
<th>Approved</th>
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<tbody>
<tr>
<td>Pauls-Grab_Bar_Justification_Detail.pdf</td>
<td>This file provides the full justification for the public input.</td>
<td></td>
</tr>
<tr>
<td>CPSC_NEISS_Sample_Narratives_for_Product_Code_0611_Injuries_in_2010.pdf</td>
<td>This provides supplementary information on the incidents occurring with baths/showers, resulting in hospital treatment in 2010, as reported by US CPSC/NEISS.</td>
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Statement of Problem and Substantiation for Public Input

An expanded coverage of this outline justification is provided in an accompanying, supplementary document, intended for use by all in processing this public input which is going to 8 occupancy chapters each in NFPA 101 and NFPA 5000.

The addition of requirements for grab bars, for bathtubs, bathtub-shower combinations and showers is within the scope of the Code in the same way that handrails are essential to the Code in relation to stairs.

The proposal builds on the need to protect occupants encountering facilities addressed by Code requirements for Changes in Elevation and Slip Resistance.

The proposal addresses two aspects of people’s movement when accessing and egressing baths/showers.
1. Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
2. Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

Outside the scope of the proposal are grab bars specifically intended for persons with disabilities, requiring more complex configurations and placements of grab bars, which are covered in great detail in ICC/ANSI A117.1

Grab bars for use by everyone have been mainstreamed for a long time, along with automatic sprinklers, for all hotel guest rooms of a well-known, major hotel chain.

Regarding epidemiology, of three important causes of injury in buildings, fire is by far the smallest cause of injuries. Baths/showers are the site of about 13 times more injuries than fire and stairs are the site of about 50 times more injuries than fire as a cause. (See the expanded, detailed justification for this, including a pie chart illustrating these ratios.)

From a public health perspective, the injuries are only one aspect of harm; the other is reduced use.
(and fear of use) of baths/showers and stairs; this affects well being, fitness, and health generally. The societal costs of the injuries alone is on the order of 100 billion dollars per year in the USA and other health implications could be comparable in order of magnitude.

As with stairs, there is well-established, authoritative literature on testing, ergonomic analyses and recommendations on scoping and detailed technical criteria; the expanding summary reviews and cites such literature, especially as it specifically supports the scope and detail in the public input for grab bar installation.

The provision of grab bars, under requirements in codes and standards has been specifically addressed in formal public policies adopted by not only the American Public Health Association but also the Canadian Public Health Association.

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury cost sand disability ramifications, in addition to general health benefits including sanitation and well being generally. They are very much within the scope of NFPA's currently stated mission, "We help save lives and reduce loss with information, knowledge and passion," and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.

Submitter Information Verification

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Submittal Date: Sun Jul 05 14:16:42 EDT 2015

Committee Statement

Statement: See statement on PI-160.
Detailed Justification for Proposals for New Requirements for Grab Bars for New Baths and Showers
Submitted by Jake Pauls, CPE, representing himself and Linda Strobl, Public Health Nurse

For NFPA 5000 (Building Construction and Safety Code) and NFPA 101 (Life Safety Code) Chapters, specifically Section —.5 Services, in:

- NFPA 5000 Ch. 18 and NFPA 101 Ch. 16 – New Day-Care Occupancies
- NFPA 5000 Ch. 19 and NFPA 101 Ch. 18 – New Health Care Occupancies
- NFPA 5000 Ch. 20 and NFPA 101 Ch. 20 – New Ambulatory Health Care Occupancies
- NFPA 5000 Ch. 22 and NFPA 101 Ch. 24 – One- and Two-Family Dwellings
- NFPA 5000 Ch. 23 and NFPA 101 Ch. 26 – Lodging or Rooming House Occupancies
- NFPA 5000 Ch. 24 and NFPA 101 Ch. 28 – New Hotels and Dormitories
- NFPA 5000 Ch. 25 and NFPA 101 Ch. 30 – New Apartment Buildings
- NFPA 5000 Ch. 26 and NFPA 101 Ch. 32 – New Residential Board and Care

Goals and Objectives of the Codes: NFPA 5000 4.1.3.3.2.1 “Buildings shall be designed and constructed to reduce the probability of death or injury to occupants from falls during normal use.”

NFPA 101 does not have comparable language, regarding “falls,” however it has the same requirements and leads to the same efficacy of such requirements—that help prevent and mitigate falls, e.g., with required handrail provisions, as does NFPA 5000. Generally, NFPA 101’s broad “Goals” requirement in Section 4.1.1, is intended to “provide an environment for the occupants that is reasonably safe from fire by the following means: (1)*Protection of occupants not intimate with the initial fire development (2) . . . .” Section 4.2. deals with parallel, but more detailed requirements dealing with objectives, e.g., 4.2.1 Occupant Protection. “A structure shall be designed, constructed and maintained to protect occupants who are not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.”

Notably, a leading emergency situation is the undesired activation of a smoke alarm when exposed to high humidity from operation of a shower in the vicinity. A prudent person in the shower, or even a person just anxious to have the alarm stop, will typically exit a shower facility in a hurry, thus exposing her/himself to increased danger of a misstep and fall due to dangerous underfoot conditions that should be mitigated according to longstanding requirements in the Code to prevent and mitigate missteps and falls generally.

Application: Triggering the proposed new requirement for grab bars is NFPA 5000 Section 11.1.6.2 [and NFPA 101 Section 7.1.6.2]:

“Changes in Elevation. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 in. (6.3 mm). Changes in elevation exceeding 1/4 in. (6.3 mm), but not exceeding 1/2 in. (13 mm), shall be beveled 1 to 2. Changes in elevation exceeding 1/2 in. (13 mm) shall be considered a change in level and shall be subject to the requirements of 11.1.7” [7.1.7 in NFPA 101].

Such criteria are well established and appear, with the exact same criteria, in many standards such as, prominently, ICC/ANSI A117.1, and ASTM F1637.

Note should be taken of the requirement in both codes (NFPA 5000 11.1.6.4 and NFPA 101 7.1.6.4) for walking surfaces that are: “slip resistant under foreseeable conditions.” The pertinent Annex notes clearly identify areas that are expected to be wet as subject to this requirement.
Thus the proposed new requirements for NFPA 5000 and NFPA 101, requiring grab bars for new baths and showers, are triggered by:
- ambulation (stepping behavior) traversing elevation changes exceeding ½ inch (13 mm), and
- high risk of slippery surfaces.

Thus, exempt from the requirement—unless grab bars are installed voluntarily—are certain showers, designed without a raised sill in excess of ½-inch (13 mm) height, but otherwise designed for water containment within the shower facility and for slip resistant underfoot surfaces when wet.

**Features of the Specified Grab Bars.** The grab bars included in the proposed rule are ones used by ambulatory persons transferring into or out of a bathing facility, whether it is designed solely for use as a shower, solely for the use of bathing or combines options of showering and bathing. Proposed grab bar requirements, all in each code’s Section 5 (Services) of the seven relevant occupancy chapters (with Chapter numbers indicated here with an “X”), are partly based on two kinds of use:
- X.5.5.1 Utility for people remaining in a standing position and thus within easy reach of a vertically oriented, readily grasped, grab bar at an appropriate height and lateral position;
- X.5.5.2 Moving to or from a crouching or seated position in water—hence applicable only to bathtubs—and thus within easy reach of a horizontal or diagonal, readily grasped grab bar also at an appropriate height and lateral position.

For each of these there are two design options, either of which will meet the requirements.

Grab bars specifically intended for persons with disabilities, requiring other configurations and placement of grab bars, are beyond the scope of the proposed requirement. ICC/ANSI A117.1 provides for the full spectrum of needs of people with disabilities that prevent independent standing while cleansing with water. In other words, the new requirement is for fully ambulatory, typically independent, transfers into or from a showering or bathing facility, a scenario causing more serious injuries than does fire in buildings and facilities (see pie chart below) and a scenario that is increasing in frequency—and severity—with demographic changes in the population generally (see data below).

The proposal is being submitted for health care occupancies as covered in NFPA 5000 Chapter 19 and NFPA 101 Chapter 18. The Health Care Occupancies Technical Committee has a better sense of what aspects of such occupancies should be scoped for the proposed requirements for grab bars. Falls by patients, and related injuries by staff (in attempting to assist patients with bathing), are a leading problem of safety in health care facilities of almost all types. It is assumed, by the proponents, that fall dangers are already being mitigated with provision of grab bars in some areas of hospitals and nursing homes for example. However, it is not clear to what extent those are already covered by requirements, other than those in NFPA 101 and NFPA 5000; hence the proposal might need focusing on specific areas. This is left for scoping decisions by the Technical Committee who, it is hoped, see the value of consistent grab bar requirements throughout the Code.

**Two Details of Design and Installation.**

(1) Unlike many grab bar requirements specifying an absolute clearance between the grab bar and adjacent wall surfaces, the proposed requirement specifies only a minimum clearance, an approach similar to that for handrails specified by NFPA 5000 and NFPA 101; this is addressed in a proposed new Annex note. Moreover, such newly required vertical grab bars can be wall mounted or mounted between a floor and ceiling or a combination of attachment to a floor, a ceiling or a wall. Commercially available grab bar systems exist for
all of these combinations with the best ones being the result of extensive biomechanics and other testing.

(2) The loading requirement for grab bars is already covered by existing language in NFPA 5000 and, if needed for NFPA 101, should be based on the same standard. The NFPA 5000 requirement is: “35.6.5.1 All required handrails, guardrails, grab bars, vehicle barrier systems, and fixed ladders shall be designed and constructed to the structural loading conditions in Section 4.5 of ASCE/SEI 7.”

**Current Exemplars.** Considering the real world of many examples of bathing facilities, one of the proponents wishes to note that one well-known, progressive major hotel chain is recognized for leading the way in having automatic sprinkler protection for guest rooms of all of its properties worldwide. Less well recognized is its longstanding policy to provide grab bars serving its guests stepping into and out of guest room bathtubs and dedicated showers. As the *young adult* victim of an injurious fall while attempting to step out of a bathtub in a hotel guest room, one of the proponents has had a longstanding personal policy of staying at the progressive hotel chain, in preference to others, and utilizing the grab bars as a matter of normal course—well before, as well as well after, achieving his 65th birthday. In other words, the provision of grab bars must not be thought of merely as an essential aid for people over 65 years of age, a common limitation in too many fall prevention programs focused on who suffers the most-severe injuries, rather than the ergonomics applicable to the entire population.

**Comparisons of Three Prominent Dangers.** Grab bars are just as important—*for everyone*—as are handrails on stairs. Even with their slightly different objectives, both NFPA 5000 and NFPA 101 do not permit new stairs without handrails. New bathing facilities are similarly in need of Code requirements for grab bar installation as a mainstreamed measure for safety in all conditions of use—*by all users*. Indeed, from a risk-per-use perspective, each step into and out of a bathing facility is, currently—without grab bars—more dangerous than is taking a step up or down on a stair. See the pie chart below that clearly shows the high number of injuries associated with baths and showers in the USA in 2010.

*Sources: NFPA and CPSC/NEISS*
Injury Epidemiology. The following are some insights from the US Consumer Product Safety Commission National Electronic Injury Surveillance System (CPSC-NEISS) product code 611 for bathtubs or showers, excluding enclosures, faucets, spigots and towel racks. For the year 2010, CPSC-NEISS estimated 262,745 visits to US hospital emergency rooms based on a sample count (from about 100 US hospitals) of 6,946 visits for which short naratives can be downloaded from its Web site. Such visits, with or without treatment, occurred to people of all ages. Those that resulted in hospital admission—23,107 estimated cases in the US in 2010—occurred prominently (roughly 77%) among people 60 years and older, i.e., persons more vulnerable to serious injury in falls and having more complications in health status generally.

Not only are the numbers large absolutely and large relative to fire-related injuries to civilians, they are also growing rapidly as fire-related injuries drop in number, indeed by about half in recent decades. Bath and shower-related injuries in the US grew in the two decades between 1991 and 2010 by a factor of two for those resulting in an Emergency Room (ER) visit and by a factor of three for those resulting in hospital admission after first going to the ER. These increases exceed, by a factor of two or three even the troubling increases in stair-related injuries in the US with number of stair-related cases doubling for some ages (especially the 45-60 age group), even in the shorter period, 1997-2010. Generally for all ages, stair-related injuries grew by about 65 percent over all ages for hospitalized cases between 1991 and 2010. The pie chart (above) is merely a snapshot in time; it reveals relative magnitude of the problems but not their respective growth. NFPA has responded relatively well with stair-related requirements in the last decade or so; now it should address—perhaps only for the first time—the second leading category of predictable and preventable injuries in buildings.

Unlike fire, the fear of which does not greatly affect healthful human activity, concern about both the dangers of stairs and the dangers of baths and showers affects other health-sustaining activities. Thus, from a public health perspective, there are dual sets of consequences from dangerous stairs and dangerous baths and showers. (See sections on cost of injuries and on public health policies below.)

Ergonomic Perspectives on the Special Dangers of Baths and Showers. What all people faced, and continue to face, in the use of bathtubs or showers are wet surfaces that (being chosen for their ease of cleaning) are generally hard and smooth. Moreover, unlike other ambulation challenges, they might require stepping over tub walls typically about 15 inches above the floor—even higher with some large, showpiece tubs increasingly found in homes. Furthermore some surfaces may be degraded with slippery soap and shampoo chemicals that drastically affect slip resistance. Further exacerbating the problems, those people dependent on corrective glasses for clear vision, would encounter these conditions without them. There are other conditions, common in bathing, that exacerbate injury dangers even more.

There are virtually no countermeasures commonly installed to mitigate some of these dangers; the only solid “points of control” (something to hold onto securely—a concept in occupational ergonomics) might be the edges of a vanity countertop but these, like other features of the bathroom, are not designed to be grasped with sufficient security to avert or mitigate a fall. These other features might include towel racks or flimsy storage shelving for toiletries, etc. They might take small loads but are not designed to mitigate a fall nor are they biomechanically designed to be in the right place, configuration and size.

Societal Injury Costs. The societal costs, in the USA in 2010, of the bath and shower-related
injuries were estimated at about 20 billion dollars (with, as noted above, about 263,000 injuries leading to a hospital ER visit). For comparison, in 2010, stair-related injuries were responsible for about 92 billion dollars and led to about 1,232,000 visits to US hospital ERs. Societal cost per injury is about the same for each injury type. The information source here (which used CPSC/NEISS data) is: Lawrence, B., Spicer, R., Miller, T. A fresh look at the costs of non-fatal consumer product injuries. *Injury Prevention*, digital publication, August 2014, paper journal publication, 2015:21:23-29.

Fire-related injuries to civilians occurred to fewer than 20,000 people in the USA (according to recent NFPA-published estimates); injuries from hot water resulted in about 37,000 ER visits in 2010 (according to CPSC NEISS data) and about a sixth of the societal injury cost from baths and showers. For a better picture of what kinds of injury events occur in baths and showers, the proposal justification is also accompanied by four pages of small samples (160 cases), derived from US CPSC NEISS Web information (not subject to copyright), from the over 7,5000 one-line narratives for ER visits, in 2010, in relation to baths and showers plus the hospital admissions for the same category in the NEISS sample from about 100 US hospitals. (The four pages provided are simply the first 112 and 48 cases, respectively; they are not selected otherwise in any way from the NEISS narratives. They are intended to be indicative of the records.

**Literature Resources.** There is extensive literature on ergonomic and public health aspects of important features such as handrails and grab bars. Rather than get into that literature base here, we should note that the general problem of differing orientations of public health and building-related professionals has been thoughtfully addressed by a well-known researcher, and proponent of bath grab bars in the Canadian code-development system, Dr. Nancy Edwards. Her paper, calling for a bridging between the differing perspectives of these groups of professionals also appeared in the same journal as noted above: Edwards, N. (2008). Performance-based Building Codes: A call for injury prevention indicators that bridge health and building sectors. *Injury Prevention*, 2008, 14: 329-332. That paper cites specific research on grab bars including Sveistrup H, Lockett D, Edwards N, et al. “Evaluation of bath grab bar placement for older adults.” *Technology and Disability* 2006;13:1–11. The leading recommendation from that study has strongly influenced what is being proposed for NFPA 5000 and NFPA 101, i.e.:

“A minimum of two grab bars should be installed in all bathtubs used by seniors, one on the faucet wall (vertical) for entering and exiting the tub, and one on the back wall (horizontal or on an angle) to help with sitting down and standing up.”

In addition, another paper, “Use of different bath grab bar configurations following a balance perturbation,” by Guitard, Sveistrup, Edwards, and Lockett, 2011, reinforces the case for two sets of grab bars when in a bathing situation—a vertical grab bar at bath entry and a diagonal or horizontal grab bar on the back wall for lowering into and rising out of the bath.

**Collaborative Efforts Employed.** In the case of the grab bar proposals, described here, they specifically result from a collaboration of individuals coming from the building field and the public health field, with the former having extensive credentials in ergonomics (Board Certified in the field) and the latter working in public health but also serving on a task group focused on grab bar requirements for codes and on the equivalent of an NFPA Technical Committee responsible for a significant part of the National Building Code of Canada, Part 9, dealing with houses and small buildings. The latter, Linda Strobl, is also the first recipient of the award, conferred by the Canadian Public Health Association in 2015, named after a prominent professional in Canadian model code history—R. Stirling Ferguson—who, among other important duties on model codes, served on NFPA 101’s main committee, “The Committee on Safety to Life,” during the 1960s. The R. Stirling
Ferguson Award recognizes special achievement by an individual or organization in improving the evidence base for standards and codes for the built environment.

Thus, the proposals for grab bars are the result of a great deal of consideration based on ergonomics (in the case of the test-based insights and recommendations referenced above) and epidemiology as well as etiology (i.e., pertaining to the causes of falls) among other types of justification.

Public Policies. Moreover, the proposed addition of grab bar-related, safety codes/standards requirements for baths and showers has been addressed in the formal policy statement adopted in 2009 by the American Public Health Association (APHA), the world’s oldest and largest organization of public health professionals. Jake Pauls has been the lead representative of the APHA on several NFPA committees since 2001 (as well as the ICC Industry Advisory Committee since the mid 1990s). The Canadian Public Health Association also has formally adopted policy positions related to grab bars. Other notable names from public health, urging such new requirements, could also be mentioned here but the broadly based impetus behind this set of proposals should be very clear to NFPA committees.

The relevant recommendation from APHA Policy 200913 follows:

4. ICC and NFPA, in developing model codes and standards, should use generally a “universal design” or inclusive design philosophy, which maximizes safety and usability for the largest range of people, including elderly people or those of any age with disabilities. This includes scoping—for all new homes (subject to some very limited exemptions)—of ICC/ANSI A117.1-2009 requirements for “visit able dwelling units” as well as installation of grab bars, on the basis of ICC/ANSI A117, for all bathtubs and bathtub shower combinations of new dwelling units as well as hotel rooms.

Notably, the proposals for grab bar provision go beyond dwelling units and hotel rooms. This reflects the growing sophistication and specialization of functions that, traditionally, occurred within dwelling units for example. These include functions now being addressed also in long-term care (such as in nursing homes) and other supportive care (such as adult day care centers plus board and care facilities). Moreover, dwelling units are found not only in detached houses but, increasingly, in apartments (both for rental and for purchase). Medical care is provided in smaller, less-institutional settings such as ambulatory health care facilities. All of these are likely to have showering or bathing facilities. Even major airport terminals, serving long-haul flights, have shower facilities for passengers and perhaps others as well (the one occupancy not yet mentioned in this background to our proposals, but one that NFPA might want to consider for standards and codes beyond NFPA 101 and 5000).

Summing Up. The proposals (including their technical requirements based on certain requirements of ICC ANSI A117.1, other standards such as CSA B651, and important research) warrant very careful consideration, and acceptance, by the various NFPA Technical Committees to whom they are directed. The proposals are responsive to a major injury problem in buildings, with huge societal injury costs and disability ramifications, in addition to general health benefits including sanitation and wellbeing generally. They are very much within the scope of NFPA’s currently stated mission, “We help save lives and reduce loss with information, knowledge and passion,” and the full scope of its codes and standards which, while historically developed to address fire safety, are now not restricted to fire safety.
US CPSC NEISS: First 112 Sample Narratives (of 6,946 cases) for Product Code 0611 Injuries in 2010 – ER released w/wo treatment
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)
41 YOM FRACTURED A RIB BY SLIPPING IN THE BATHTUB & FALLING AGAINST THE TOILET AT HOME.
53 YOF SUSTAINED A CONTUSION OF A SHIN BY BUMPING IT WHILE SHOWERING AT HOME.
18 YOF SPRAINED HER LOWER BACK BY FALLING IN THE SHOWER AT SCHOOL.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB AT HOME.
18 YOF SUSTAINED A HEAD INJURY BY FALLING IN A SHOWER AT HOME.
80 YOM DISLOCATED A HIP BY LIFTING LEG IN SHOWER.
86 YOF SUSTAINED A LACERATION OF THE SCALP BY TRIPPING ON A RUG IN THE SHOWER AT HOME.
71 YOF SUSTAINED A HEAD INJURY BY FALLING FROM TOILET AGAINST THE BATHTUB AT HOME.
68 YOF SPRAINED AN ANKLE BY FALLING IN A SHOWER.
47 YOF FRACTURED A KNEE BY FALLING IN THE SHOWER AT HOME.
02 YOF SUSTAINED A LACERATION OF THE CHIN BY FALLING IN THE BATHTUB.
22 YOM SPRAINED A FOOT WHILE STEPPING OUT OF A SHOWER AT JAIL.
23 YOF SUSTAINED A CONTUSION OF A FOOT BY TRIPPING ON A RUG & STRIKING AGAINST A TUB AT HOME.
40 YOM SUSTAINED A LACERATION OF THE NOSE FROM BEING STRUCK BY THE SHOWER HEAD IN THE SHOWER AT HOME.
21 MOM RUPTURED AN EAR DRUM WITH A COTTON-TIPPED SWAB WHILE BATHING IN TUB AT HOME.
48 YOF SUSTAINED A CONTUSION OF THE NECK BY FALLING IN THE BATHTUB AT HOME.
04 YOF SLIPPED IN BATHTUB FELL AND INJURED FACE DX/ FACIAL LAC L KNEE STR
10 YOF FELL OUT OF SHOWER AND INJURED L KNEE. HAS ABRASION TO KNEE ALSO
80 YOF FELL IN SHOWER AT HOME HIT HEAD DX/ HEAD INJURY
94 YOM SLIPPED AND FELL IN SHOWER AND HIT FACE ON FLOOR DX/ FACIAL FX
55 YOM SLL LEG HEMATOMA
72 YOF CAUGHT FOOT IN TUB, INJURING LOWER LEG. NOW HAS HEMATOMA AND INCREASING PAIN.
22 YOF AT HOME FAINTED WHILE IN SHOWER AND FELL CUTTING FOREHEAD.
26 YOF SLIPPED AND FELL IN TUB DX: KNEE STRAIN
90 YOF GETTING OUT OF SHOWER WITH WALKER SLIPPED ON THE FLOOR AND HIT HEAD DX/ SCALP ABRASION
30 YOM SLIPPED AND FELL INTO TUB DX: CONTUSION TO BACK
51 YOF SLIPPED IN TUB AND HIT HEAD DX/ SCALP LAC
60 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO COCCYX
44 YOM FELL AND HIT ABDOMEN ON BATHTUB AT HOME DX/ ABDOMINAL CONTUSION
04 YOM WITH CUT TO FACE FELL IN TUB DX: LACERATION TO FACE
51 YOF AT HOME FELL AT 5PM WHEN LOST BALANCE AND HIT L SIDE OF RIBS ON BATHTUB.
33 YOF SLIPPED AND FELL IN TUB DX: HEAD LACERATION
23 MOM FELL IN BATHTUB AT HOME AND HIT CHIN CAUSING LACERATION.
62 YOM WITH BACK PAIN FELL INTO TUB DX; CONTUSION TO LOWER BACK
63 YOF FELL INTO BATHTUB / NO INJURIES OR COMPLAINTS
54 YOM SLIPPED AND FELL IN TUB DX: RIB FRACTURE
02 YOM SLIPPED IN TUB AT HOME AND INJURED FACE DX/ CHIN LAC
25 YOF WITH CHEST PAIN AFTER FALL INTO TUB DX: CONTUSION TO CHEST
84 YOM FELL OUT OF SHOWER ON TO THE FLOOR AT HOME HIT HEAD DX/ HEAD INJURY
85 YOF SLIPPED AND FELL IN TUB AND HIT HEAD AT HOME DX/ HEAD INJURY
06 YOM AT HM WAS TAKING A BATH & SWIMMING IN TUB WHEN HE STRUCK HIS HEAD AGAINST FAUCET CAUSING HEAD LACERATION.
28 YOM AT HOME FELL IN SHOWER. WAS RESPONSIVE PER EMS.
26 YOF SLIPPED / FELL IN THE SHOWER DX: R EAR LAC. / HEAD & R SHOULDER CONTUSION
36 YOF THIS AM SLIPPED WHILE TRYING TO GET OUT OF BATHTUB AND LANDED ON BUTTOCKS.
28 YOF RIPPED FINGER NAIL OFF WHEN SLIPPED IN THE SHOWER AND THE NAIL BENT BACKWARDS.
26 YOF INJURED KNEE STEPPING OUT OF SHOWER DX/ RIGHT KNEE SPRAIN
50 YOM FELL IN BATHTUB AND HIT CHEST DX/ RIB FX
83 YOM CUT SCROTUM FELL IN TUB DX: LACERATION TO SCROTUM
71 YOF FELL OUT OF BATHTUB AT HOME AND HIT HEAD ON THE FLOOR DX/ HEAD INJURY
89 YOF FELL IN TUB HITTING HEAD DX: CLOSED HEAD INJURY
69 YOF WAS IN SHOWER AND FELL BACKWARDS STRIKING HER BACK.
08 YOF AT HOME LACERATED FACE ABOVE R ORBITAL. HIT HER HEAD ON SOAP DISH WHILE SHOWERING. NO LOC.
40 YOM SLIPPED AND FELL IN SHOWER AND INJURED CHEST DX/ RIB FX
17 YOF FELL IN TUB HURT NECK DX: NECK STRAIN
23 YOM INJURED LOWER BACK BENDING OVER IN SHOWER AT HOME DX/ LUMBAR STRAIN
83 YOF FELL IN THE TUB AT ASSISTED LIVING AND INJURED SHOULDER DX/ RT SHOULDER CONTUSION
02 YOM HIT FACE ON BATHTUB AT HOME DX/ FACIAL LAC
74 YOM FELL AND HIT HEAD IN TUB DX: CONTUSION TO HEAD
85 YOF SLIPPED AND FELL GETTING OUT OF TUB DX: CONTUSION TO HIP
58 YOF SLIPPED AND FELL INTO TUB HIT HEAD DX: CLOSED HEAD INJURY
13 MOM AT HOME FELL IN BATHTUB AND HIT FOREHEAD AND MOUTH.
06 YOM SLIPPED IN BATHTUB AND HIT HEAD DX/ HEAD CONTUSION
78 YOM SLIPPED AND FELL IN TUB DX: LACERATION TO HEAD
08 YOM SLIPPED IN TUB TWISTED ANKLE DX: ANKLE STRAIN
51 YOF HIT HEAD ON SOAP DISH IN SHOWER 2 TIMES THIS WEEK HAS HEADACHE DX/ CONCUSSION
51 YOF SLIPPED IN SHOWER AND INJURED KNEE AT HOME DX/ RIGHT KNEE CONTUSION
83 YOM SLIPPED AND FELL IN THE SHOWER LAST NIGHT AND INJURED BACK DX/ BACK PAIN
31 YOM HIT EYE WITH TOWEL WHILE GETTING OUT OF THE SHOWER AT HOME DX/ RIGHT EYE CORNEAL ABRASION
24 YOF FELL GETTING OUT OF SHOWER HIT HEAD DX/ SCALP LAC
48 YOF SLIPPED IN SHOWER HIT HEAD + LOC DX/ HEAD INJURY
11 YOM SLIPPED IN SHOWER AND INJURED LEG DX/ LEFT LEG CONTUSION
30 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO HIP
18 MOM FELL IN TUB DX: LACERATION TO FACE
46 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO LOWER BACK
30 YOM CUT HAND ON BROKEN SOAP DISH AT HOME  DX// RIGHT HAND LAC
70 YOF SLIPPED AND FELL IN TUB DX: CONTUSION TO CHEST
31 YOM CUT THUMB ON SHOWER DRAIN THIS AM.
62 YOF SLIPPED IN THE SHOWER AND FELL ON THE FLOOR AT HOME DX/ LEFT WRIST SPRAIN
67 YOM FELL GETTING OUT OF SHOWER HIT HEAD ON TUB AT HOME DX/ SCALP CONTUSION
45 YOF PASSED OUT IN SHOWER AT GROUP HOME HIT HEAD DX/ HEAD INJURY
04 YOF FELL IN BATHTUB AND HIT MOUTH DX/ LIP LAC
43 YOM SLIPPED IN BATHTUB AND INJURED KNEE DX/ LEFT KNEE CONTUSION
15 YOM TAKING SHOWER AND SHOWER DOOR SHATTERED AND PT FEET WERE CUT WITH THE GLASS AT HOME DX/ BILAT FOOT LAC
73 YOF AT 9AM TODAY WAS GETTING OUT OF TUB AND SLIPPED AND BUM PED L RIBS ON THE TUB. C/O RIB PAIN.
87 YOF BENT DOWN TO PUT SCALE AWAY FELL AND HIT INTO TUB AT HOME DX/ LEFT HIP CONTUSION
22 YOF FELL IN TUB AT HOME AND INJURED CHEST DX/ RIB FX
40 YOF SLIPPED GETTING OUT OF BATHTUB AND INJURED LOWER BACK DX/ LOW BACK PAIN
34 YOM FELL AND HIT TUB DX: SHOULDER STRAIN
70 YOF SLIPPED FELL HIT CHEST ON SIDE OF TUB DX: CONTUSION TO CHEST
89 YOF SLIPPED AND FELL IN THE SHOWER LAST NIGHT AT NURSING HOME INJURED CHEST DX/ CHEST CONTUSION
44 YOM FELL IN TUB AND HIT CHEST DX.CHEST CONTUSION
36 YOF SLIPPED AND FELL IN TUB DX: LACERATION TO FACE
56 YOM CUT WRIST ON BROKEN SHOWER KNOB AT HOME DX/ LEFT WRIST LAC
88 YOF FELL AT HOME IN SHOWER AND HIT HEAD ON TUB DX/ SCALP CONTUSION
51 YOM SLIPPED AND FELL IN TUB DX: NECK STRAIN
23 YOM FELL IN BATH TUB AND INJURED CHEST DX/ CHEST CONTUSION
59 YOM FELL IN SHOWER AND INJURED SHOULD ER DX/ LEFT SHOULDER FX
46 YOM HAD FALL HIT TUB DX: CONTUSION TO FACE
78 YOF FELL AT HOME AND HIT FACE ON BATHTUB DX/ FACIAL CONTUSION
29 YOF WITH BACK PAIN AFTER FALL IN TUB DX: LOW BACK STRAIN
31 YOF FELL GETTING OUT OF TUB AT HOME INJURED FLANKDX/ FLANK CONTUSION
72 YOF AT HOME FELL WHEN SLIPPED ON URINE IN BATHROOM AND HIT HEAD ON SIDE OF BATH TUB.
19 YOF SLIPPED AND FELL INTO TUB DX: CONTUSION TO LOWER BACK
08 YOM FELL IN THE SHOWER AT HOME AND HIT EAR DX/ LEFT EAR LAC
62 YOM SLIPPED / FELL IN THE SHOWER DX: RIB CONTUSION
09 YOF FELL IN TUB AND HIT LIP DX/ LIP LAC
56 YOF WITH SHOULDER PAIN AFTER USING BATHTBRUSH IN SHOWER DX: SHOULDER STRAIN
75 YOF AT HOME FELL OFF HASSOCK APPROX 30 MIN AGO HITTING HEAD AND L ARM ON BATHTUB. DENIES LOC.
62 YOF SLIPPED IN TUB HITTING FOOT DX: CONTUSION TO FOOT
04 YOM SLIPPED IN THE BATHTUB AND HIT CHIN DX/ CHIN LAC
34 YOM FELL IN THE SHOWER AT HOME INJURED BACK DX/ BACK SPRAIN
25 YOF + ETOH BAL 313 FELL IN SHOWER AND HIT HEAD DX/ HEAD CONTUSION
US CPSC NEISS: First 48 Sample Narratives (of 630 cases) for Product Code 0611 Injuries in 2010 – ER treated & Admitted to Hospital
(Product Code 611 covers bathtubs or showers including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)

89 YOF GETTING OUT OF THE SHOWER THE NEXT THING SHE KNEW SHE WAS ON THE FLOOR WITH HEAD AND SHOULDER INJURY; SHOULDER AND HEAD CONTUSION
86 YOM LOST BALANCE WHEN SHE TURNED AROUND & FELL INTO BATHTUB SUSTAINING CHEST CONTUSION
89 YOF TRYING TO GET OUT OF BATHTUB THIS MORNING ACCIDENTALLY FELL INJURED LOWER BACK; BACK CONTUSION AND AMBULATORY DYSFUNCTION
86 YOF SLIPPED IN THE SHOWER AND FELL FORWARD HITTING HER FACE & INJURING HER RT ARM - DX- MECHANICAL FALL W/ FRACTURE RT SHOULDER
87 YOF FAMILY FOUND HER ON THE FLOOR BETWEEN TOILET AND BATHTUB, SHE STATED SHE PASSED OUT WHEN SHE WAS IN SHOWER;SHOULDER INJURY
87 YOM HAD A WET SHEETROCK FALL ON HEAD WHILE IN SHOWER, +LOC, WAS CONFUSED. DX - BLUNT HEAD TRAUMA W/BRIEF LOC
78 YOF HAD A SYNCOPE TODAY AT HOME IN THE SHOWER INJURING EYE AREA- DX - LACERATION TO FACE( EYE)
82 YOF HAD NO INJ FROM FALL IN TUB
82 YOF TURNED IN SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.
79 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: R KNEE STRAIN W/POSS INTERNAL DERANGEMENT, CLOSED HEAD INJURY.
80 YOF WITH NO INJ FROM FALL IN TUB
79 YOF WITH LOWER BACK STRAIN FROM FALL IN SHOWER
97 YOF FELL IN THE SHOWER AT NURSING HOME. DX: TRAUMATIC SDH, AGITATION.
79 YOF SLIPPED IN BATHTUB AND GRAZED HEAD ON SHELF AT ASSISTED LIVING. DX: BACK/SHOULDER, SYNCPE, STAGE I THORACIC DECUBITUS ULCER, MULT OLD THORACIC FX'S.
55 YOM SLIPPED AND FELL IN BATHTUB. DX: R HEMOTHORAX/PNEUMOTHORAX, MULT R RIB FXS.
95 YOF TRIpped OVER THROW RUG WHILE GETTING INTO SHOWER AT HOME DX: AVULSION TO FACE/ MALIGNANT HYPERTENSION
53 YOF SLIPPED IN SHOWER AND FELL HITTING HIP ON TOILET AT HOME DX: STRAINED RIGHT HIP/ UNCONTROLABLE DIABETES
Adult Foster Homes

(1) GENERAL CONDITIONS.

(a) INTERIOR AND EXTERIOR PREMISES. The building and furnishings, patios, decks, and walkways, as applicable, must be clean and in good repair. The interior and exterior premises must be well maintained and accessible according to the individual needs of the residents. There must be no accumulation of garbage, debris, rubbish, or offensive odors. Walls, ceilings, and floors must be of such character to permit washing, cleaning, or painting, as appropriate.

(b) ADDRESS. The address numbers of the adult foster home must be placed on the home in a position that is legible and clearly visible from the street or road fronting the property. Address numbers must be a minimum of 4 inches in height, made of reflective material, and contrast with their background.

(c) LIGHTING. Adequate lighting, based on the needs of the occupants, must be provided in each room, stairway, and exit way. Incandescent light bulbs and florescent tubes must be protected with appropriate covers.

(d) TEMPERATURE. The heating system must be in working order. Areas of the home used by the residents must be maintained at a comfortable temperature. Minimum temperatures during the day must be not less than 68 degrees, no greater than 85 degrees, and not less than 60 degrees during sleeping hours. Variations from the requirements of this rule must be based on resident care needs or preferences and must be addressed in each resident's care plan.

(A) During times of extreme summer heat, the licensee must make reasonable effort to keep the residents comfortable using ventilation, fans, or air conditioning. Precautions must be taken to prevent resident exposure to stale, non-circulating air.

(B) If the facility is air-conditioned, the system must be functional and the filters must be cleaned or changed as needed to ensure proper maintenance.

(C) If the licensee is unable to maintain a comfortable temperature for the residents during times of extreme summer heat, air conditioning or another cooling system may be required.

(e) COMMON USE AREAS. Common use areas for the residents must be accessible to all residents. There must be at least 150 square feet of common living space and sufficient furniture in the home to accommodate the recreational and socialization needs of all the occupants at one time. Common space may not be located in an unfinished basement or garage unless such space was constructed for that purpose or has otherwise been legalized under permit. There may be additional space required if wheelchairs are to be accommodated. An additional 40 square feet of common living space is required for each day care individual, room and board tenant, or relative receiving care for remuneration that exceeds the limit of five.

(f) VIDEO MONITORS. Use of video monitors detracts from a home-like environment and the licensee may not use video monitors in any area of the home that would violate a resident's privacy unless requested by the resident or the resident's legal representative. The licensee may not ask the resident or the resident's legal representative to waive the resident's right to privacy as a condition of admission to the home.

(2) SANITATION AND PRECAUTIONS.

(a) NON-MUNICIPAL WATER SOURCE. A public water supply must be utilized if available. If a non-municipal water source is used, the licensor, a sanitarian, or a technician from a certified water-testing laboratory must collect a sample annually or as required by the Department. The water sample must be tested for coliform bacteria. Water testing and any necessary corrective action to ensure water is suitable for drinking must be completed at the licensee’s expense. Water testing records must be...
(b) Septic tanks or other non-municipal sewage disposal systems must be in good working order.

(c) **COMMODES AND INCONTINENCE GARMENTS.** Commodes used by residents must be emptied frequently and cleaned daily, or more frequently if necessary. Incontinence garments must be disposed of in closed containers.

(d) **WATER TEMPERATURE.** A resident who is unable to safely regulate the water temperature must be supervised.

(e) **LAUNDRY.** Prior to laundering, soiled linens and clothing must be stored in closed containers in an area that is separate from food storage, kitchen, and dining areas. Pre-wash attention must be given to soiled and wet bed linens. Sheets and pillowcases must be laundered at least weekly and more often if soiled.

(f) **Garbage and refuse must be suitably stored in readily cleanable, rodent-proof, covered containers, pending weekly removal.**

(g) **VENTILATION.** All doors and windows that are used for ventilation must have screens in good condition.

(h) **INFECTION CONTROL.** Standard precautions for infection control must be followed in resident care. Hands and other skin surfaces must be washed immediately and thoroughly if contaminated with blood or other body fluids.

(i) **DISPOSAL OF SHARPS.** Precautions must be taken to prevent injuries caused by needles, scalpels, and other sharp instruments or devices during procedures. After use, disposable syringes and needles, scalpel blades, and other sharp items must be placed in a puncture-resistant, red container for disposal. The puncture-resistant container must be located as close as practical to the use area. Disposal must be made according to local regulations and resources (ORS 459.386 to 459.405).

(j) **FIRST AID.** Current, basic first-aid supplies and a first-aid manual must be readily available in the home.

(k) **PESTS.** Reasonable precautions must be taken to prevent pests (e.g., ants, cockroaches, other insects, and rodents).

(l) **PETS OR OTHER ANIMALS.** Sanitation for household pets and other domestic animals on the premises must be adequate to prevent health hazards. Proof of rabies vaccinations and any other vaccinations that are required for the pet by a licensed veterinarian must be maintained on the premises. Pets not confined in enclosures must be under control and not present a danger to the residents or guests.

(m) **SAFETY BARRIERS.** Patios, decks, walkways, swimming pools, hot tubs, spas, saunas, water features, and stairways, as appropriate, must be equipped with safety barriers designed to prevent injury. Resident access to or use of swimming or other pools, hot tubs, spas, or saunas on the premises must be supervised.

(3) **BATHROOMS.** Bathrooms must:

(a) Provide individual privacy and have a finished interior with a door that opens to a hall or common-use room. If a bedroom includes a private bathroom, the door for the private bathroom must open to the bedroom. No person must have to walk through another person's bedroom to access a bathroom;

(b) Be large enough to accommodate the individual needs of the residents and any equipment that may be necessary;

(c) Have a mirror, a window that opens or other means of ventilation, and a window covering for privacy;

(d) Be clean and free of objectionable odors;
(e) Have bathtubs, showers, toilets, and sinks in good repair. A sink must be located near each toilet and a toilet and sink must be available for the resident’s use on each floor with resident rooms. There must be at least one toilet, one sink, and one bathtub or shower for each six household occupants (including residents, day care individuals, room and board tenants, the licensee, and the licensee’s family);

(f) Have hot and cold water at each bathtub, shower, and sink in sufficient supply to meet the needs of the residents;

(g) Have nonporous surfaces for shower enclosures. Glass shower doors, if applicable, must be tempered safety glass, otherwise, shower curtains must be clean and in good condition;

(h) Have non-slip floor surfaces in bathtubs and showers;

(i) Have grab bars for each toilet, bathtub, and shower to be used by the residents for safety;

(j) Have barrier-free access to toilet and bathing facilities; and

(k) Have adequate supplies of toilet paper and soap supplied by the licensee. Residents must be provided with individual towels and washcloths that are laundered in hot water at least weekly or more often if necessary. Residents must have appropriate racks or hooks for drying bath linens. If individual hand towels are not provided, roller-dispensed hand towels or paper towels in a dispenser must be provided for the residents’ use.

(4) BEDROOMS.

(a) Bedrooms for all household occupants must:

(A) Have been constructed as a bedroom when the home was built, or remodeled under permit;

(B) Be finished with walls or partitions of standard construction that go from floor to ceiling;

(C) Have a door that opens directly to a hallway or common use room without passage through another bedroom or common bathroom. The bedroom door must be large enough to accommodate the occupant of the room and any mobility equipment that may be needed by the resident;

(D) Be adequately ventilated, heated, and lighted with at least one window that opens and meets the requirements in section (5)(e) of this rule;

(E) Be at least 70 square feet of usable floor space for one resident or 120 square feet for two residents excluding any area where a sloped ceiling does not allow a person to stand upright; and

(F) Have no more than two occupants per room. Residents must be limited to five adults who require care and are unrelated to the licensee and resident manager by blood, marriage, or adoption.

(2) The number of residents permitted to reside in an adult foster home is determined by the ability of the staff to meet the care needs of the residents, the fire and life safety standards for evacuation, and compliance with the facility standards of these rules.

(a) Children over the age of five have a bedroom available that is separate from their parents. This rule is not intended to prohibit a child five years of age or younger from occupying their parent’s bedroom.

(b) The licensee, any other caregivers, and family members may not sleep in areas designated as living areas or share a bedroom with a resident. This rule is not intended to prohibit a caregiver or other person of the resident’s choosing from temporarily staying in the resident’s room when required by the resident’s condition.

(c) There must be a bed at least 36 inches wide for each resident consisting of a
mattress and springs, or equivalent, in good condition. Cots, rollaways, bunks, trundles, daybeds with restricted access, couches, and folding beds may not be used for residents. Each bed must have clean bedding in good condition consisting of a bedspread, mattress pad, two sheets, a pillow, a pillowcase, and blankets adequate for the weather. Waterproof mattress covers must be used for incontinent residents. Day care individuals may use a cot or rollaway bed if bedroom space is available that meets the requirements of section (4)(a) of this rule. A resident's bed may not be used by a day care individual.

(d) Each resident's bedroom must have separate, private dresser and closet space sufficient for the resident's clothing and personal effects including hygiene and grooming supplies. A resident must be provided private, secure storage space to keep and use reasonable amounts of personal belongings. A licensee may not use a resident's bedroom for storage of items, supplies, devices, or appliances that do not belong to the resident.

(e) Drapes or shades for bedroom windows must be in good condition and allow privacy for the residents.

(f) A resident who is non-ambulatory, has impaired mobility, or is cognitively impaired must have a bedroom with a safe, second exit at ground level. A resident with a bedroom above or below the ground floor must demonstrate their capability for self-preservation.

(g) Resident bedrooms must be in close enough proximity to the licensee or caregiver in charge to alert the licensee or caregiver in charge to resident nighttime needs or emergencies, or the bedrooms must be equipped with a functional call bell or intercom within the residents' abilities to operate. Intercoms may not violate the resident's right to privacy and must have the capability of being turned off by the resident or at the resident's request.

(h) Bedrooms used by the licensee, resident manager, shift caregiver, and substitute caregiver, as applicable, must be located in the adult foster home and must have direct access to the residents through an interior hallway or common use room.

(5) SAFETY.

(a) FIRE AND LIFE SAFETY. Buildings must meet all applicable state and local building, mechanical, and housing codes for fire and life safety. The home may be inspected for fire safety by the State Fire Marshal's Office, or the State Fire Marshal's designee, at the request of the local licensing authority or the Department using the standards in these rules, as appropriate.

(b) HEAT SOURCES. All heating equipment, including but not limited to wood stoves, pellet stoves, and fireplaces must be installed in accordance with all applicable state and local building and mechanical codes. Heating equipment must be in good repair, used properly, and maintained according to the manufacturer's or a qualified inspector's recommendations.

(A) A licensee who does not have a permit verifying proper installation of an existing woodstove, pellet stove, or gas fireplace must have it inspected by a qualified inspector, Certified Oregon Chimney Sweep Association member, or Oregon Hearth, Patio, and Barbeque Association member and follow their recommended maintenance schedule.

(B) Fireplaces must have approved and listed protective glass screens or metal mesh screens anchored to the top and bottom of the fireplace opening.

(C) The local licensing authority may require the installation of a non-combustible, heat-resistant, safety barrier 36 inches around a woodstove to prevent residents with ambulation or confusion problems from coming in contact with the stove.

(D) Unvented, portable oil, gas, or kerosene heaters are prohibited. Sealed electric transfer heaters or electric space heaters with tip-over, shut-off capability may be used...
when approved by the State Fire Marshal or the State Fire Marshal's designee. A heater must be directly connected to an electrical outlet and may not be connected to an extension cord.

(c) EXTENSION CORDS AND ADAPTORS. Extension cord wiring and multi-plug adaptors may not be used in place of permanent wiring. UL-approved, re-locatable power taps (RPTs) with circuit breaker protection and no more than six electrical sockets are permitted for indoor use only and must be installed and used in accordance with the manufacturer's instructions. If RPTs are used, the RPT must be directly connected to an electrical outlet, never connected to another RPT (known as daisy-chaining or piggy-backing), and never connected to an extension cord.

(d) LOCKS AND ALARMS. Hardware for all exit doors and interior doors must be readily visible, have simple hardware that may not be locked against exit, and have an obvious method of operation. Hasps, sliding bolts, hooks and eyes, slide chain locks, and double key deadbolts are not permitted. If a home has a resident with impaired judgment who is known to wander away, the home must have an activated alarm system to alert a caregiver of the resident's unsupervised exit.

(e) WINDOWS. Bedrooms must have at least one window or exterior door that leads directly outside, readily opens from the inside without special tools, and provides a clear opening of not less than 821 square inches (5.7 sq. ft.), with the least dimensions not less than 24 inches in height or 20 inches in width. If the interior sill height of the window is more than 44 inches from the floor level, approved steps or other aids to the window exit that the occupants are capable of using must be provided. Windows with a clear opening of not less than 5.0 square feet or 720 square inches with interior sill heights of no more than 48 inches above the floor may be accepted when approved by the State Fire Marshal or the State Fire Marshal's designee.

(f) CONSTRUCTION. Interior and exterior doorways must be wide enough to accommodate the mobility equipment used by the residents such as wheelchairs and walkers. All interior and exterior stairways must be unobstructed, equipped with handrails on both sides, and appropriate to the condition of the residents. (See also section (5)(q) of this rule)

(A) Buildings must be of sound construction with wall and ceiling flame spread rates at least substantially comparable to wood lath and plaster or better. The maximum flame spread index of finished materials may not exceed 200 and the smoke developed index may not be greater than 450. If more than 10 percent of combined wall and ceiling areas in a sleeping room or exit way is composed of readily combustible material such as acoustical tile or wood paneling, such material must be treated with an approved flame retardant coating. Exception: Buildings supplied with an approved automatic sprinkler system.

(i) MANUFACTURED HOMES. A manufactured home (formerly mobile homes) must have been built since 1976 and designed for use as a home rather than a travel trailer. The manufactured home must have a manufacturer's label permanently affixed on the unit itself that states the manufactured home meets the requirements of the Department of Housing and Urban Development (HUD). The required label must read as follows:

"As evidenced by this label No. ABC000001, the manufacturer certifies to the best of the manufacturer's knowledge and belief that this mobile home has been inspected in accordance with the requirements of the Department of Housing and Urban Development and is constructed in conformance with the Federal Mobile Home Construction and Safety Standards in effect on the date of manufacture. See date plate."

(ii) If such a label is not evident and the licensee believes the manufactured home meets the required specifications, the licensee must take the necessary steps to secure and provide verification of compliance from the home's manufacturer.

(iii) Manufactured homes built since 1976 meet the flame spread rate requirements and
do not have to have paneling treated with a flame retardant coating.

(B) STRUCTURAL CHANGES. The licensee must notify the local licensing authority in writing at least 15 calendar days prior to any remodeling, renovations, or structural changes in the home that require a building permit. Such activity must comply with local building, sanitation, utility, and fire code requirements applicable to a single-family dwelling (see ORS 443.760(1)). The licensee must forward all required permits and inspections, an evacuation plan as described in section (5)(k) of this rule, and a revised floor plan as described in section (5)(o) of this rule to the local licensing authority within 30 calendar days of completion.

(g) FIRE EXTINGUISHERS. At least one fire extinguisher with a minimum classification of 2-A:10-B:C must be mounted in a location visible and readily accessible to any occupant of the home on each floor, including basements. Fire extinguishers must be checked at least once a year by a qualified person who is well versed in fire extinguisher maintenance. All recharging and hydrostatic testing must be completed by a qualified agency properly trained and equipped for this purpose.

(h) CARBON MONOXIDE AND SMOKE ALARMS.

(A) CARBON MONOXIDE ALARMS. Carbon monoxide alarms must be listed as complying with ANSI/UL 2034 and must be installed and maintained in accordance with the manufacturer's instructions. Carbon monoxide alarms must be installed within 15 feet of each bedroom at the height recommended by the manufacturer.

(i) If bedrooms are located in multi-level homes, carbon monoxide alarms must be installed on each level including the basement.

(ii) Carbon monoxide alarms may be hard-wired, plug-in, or battery operated. Hard wired and plug-in alarms must be equipped with a battery back-up. Battery operated carbon monoxide alarms must be equipped with a device that warns of a low battery.

(iii) A bedroom used by a hearing-impaired occupant who may not hear the sound of a regular carbon monoxide alarm must be equipped with an additional carbon monoxide alarm that has visual or vibrating capacity.

(B) SMOKE ALARMS. Smoke alarms must be installed in accordance with the manufacturer's instructions in each bedroom, in hallways or access areas that adjoin bedrooms, the family room or main living area where occupants congregate, any interior designated smoking area, and in basements. In addition, smoke alarms must be installed at the top of all stairways in multi-level homes.

(i) Ceiling placement of smoke alarms is recommended.

(ii) Battery operated smoke alarms or hard-wired smoke alarms with a battery backup must be equipped with a device that warns of a low battery.

(iii) A bedroom used by a hearing-impaired occupant who may not hear the sound of a regular smoke alarm must be equipped with an additional smoke alarm that has visual or vibrating capacity.

(C) All carbon monoxide alarms and smoke alarms must contain a sounding device or be interconnected to other alarms to provide, when actuated, an alarm that is audible in all sleeping rooms. The alarms must be loud enough to wake occupants when all bedroom doors are closed. Intercoms and room monitors may not be used to amplify alarms.

(D) The licensee must test all carbon monoxide alarms and smoke alarms in accordance with the manufacturer's instructions at least monthly (per NFPA 72). Testing must be documented in the facility records. The licensee must maintain carbon monoxide alarms, smoke alarms, and fire extinguishers in functional condition. If there are more than two violations in maintaining battery operated alarms in working condition, the Department may require the licensee to hard wire the alarms into the electrical system.
(i) COMBUSTIBLES AND FIREARMS. Flammables, combustible liquids, and other combustible materials must be safely and properly stored in their original, properly labeled containers or safety containers and secured in areas to prevent tampering by residents or vandals.

(A) Oxygen and other gas cylinders in service or in storage must be adequately secured to prevent the cylinders from falling or being knocked over;

(B) No smoking signs must be visibly posted where oxygen cylinders are present;

(C) Firearms must be stored, unloaded, in a locked cabinet. The firearms cabinet must be located in an area of the home that is not accessible to the residents; and

(D) Ammunition must be secured in a locked area separate from the firearms.

(j) HAZARDOUS MATERIALS. Cleaning supplies, medical sharps containers, poisons, insecticides, and other hazardous materials must be properly stored in their original, properly labeled containers in a safe area that is not accessible to residents or near food preparation or food storage areas, dining areas, or medications.

(k) EVACUATION PLAN. An emergency evacuation plan must be developed and revised as necessary to reflect the current condition of the residents in the home. The evacuation plan must be rehearsed with all occupants.

(l) ORIENTATION TO EMERGENCY PROCEDURES. Within 24 hours of arrival, any new resident or caregiver must be shown how to respond to a smoke alarm, shown how to participate in an emergency evacuation drill, and receive an orientation to basic fire safety. New caregivers must also be oriented in how to conduct an evacuation.

(m) EVACUATION DRILL. An evacuation drill must be held at least once every 90 calendar days, with at least one evacuation drill per year conducted during sleeping hours. The evacuation drill must be clearly documented, signed by the caregiver conducting the drill, and maintained according to OAR 411-050-0645.

(A) The licensee and all other caregivers must:

(i) Be able to demonstrate the ability to evacuate all occupants from the facility to the initial point of safety within three minutes or less. The initial point of safety must:

(I) Be exterior to and a minimum of 25 feet away from the structure;

(II) Have direct access to a public sidewalk or street; and

(III) Not be in the backyard of a home unless the backyard directly accesses a public street or sidewalk.

(ii) Be able to demonstrate the ability to further evacuate all occupants from the initial point of safety to the final point of safety within two minutes or less. The final point of safety must:

(I) Be a minimum of 50 feet away from the structure; and

(II) Located on a public sidewalk or street;

(B) Conditions may be applied to a license if the licensee or caregivers demonstrate the inability to meet the evacuation times described in this section. Conditions may include but are not limited to reduced capacity of residents, additional staffing, or increased fire protection. Continued problems are grounds for revocation or non-renewal of the license.

(n) FLOOR PLAN. The licensee must develop a current and accurate floor plan that indicates:

(A) The size of rooms;

(B) Which bedrooms are to be used by residents, the licensee, caregivers, for day care, and room and board tenants, as applicable;
(C) The location of all the exits on each level of the home, including emergency exits such as windows;

(D) The location of wheelchair ramps;

(E) The location of all fire extinguishers, smoke alarms, and carbon monoxide alarms;

(F) The planned evacuation routes, initial point of safety, and final point of safety; and

(G) Any designated smoking areas in or on the adult foster home's premises.

(o) RESIDENT PLACEMENT. A resident, who is unable to walk without assistance or not capable of self-preservation, may not be placed in a bedroom on a floor without a second ground level exit. (See also section (4)(f) of this rule)

(p) STAIRS. Stairs must have a riser height of between 6 to 8 inches and tread width of between 8 to 10.5 inches. Lifts or elevators are not an acceptable substitute for a resident's capability to ambulate stairs. (See also section (5)(f) of this rule)

(q) EXIT WAYS. All exit ways must be barrier free and the corridors and hallways must be a minimum of 36 inches wide or as approved by the State Fire Marshal or the State Fire Marshal's designee. Interior doorways used by the residents must be wide enough to accommodate wheelchairs and walkers if used by residents and beds if used for evacuation purposes. Any bedroom window or door identified as an exit must remain free of obstacles that would interfere with evacuation.

(r) RAMPS. There must be at least one wheelchair ramp from a minimum of one exterior door if an occupant of the home is non-ambulatory. A licensee may be required to bring existing ramps into revised compliance if necessary to meet the needs of new residents or current residents with increased care needs. Wheelchair ramps must comply with the Americans with Disabilities Act (ADA) and must:

(A) Have the least possible slope with a maximum slope of 1 inch rise in each 12 inches of distance;

(B) Have a maximum rise for any run of 30 inches;

(C) Have a minimum clear width of 36 inches;

(D) Have landings with a minimum clear length of 60 inches at the top and bottom of each ramp and each ramp run;

(E) Have handrails on both sides of the ramp if the ramp has a rise of 6 inches or more or a run of 72 inches or more. Handrails must:

(i) Be continuous or must extend 12 inches beyond the top and bottom of the ramp segment;

(ii) Have a clear space of 1 1/2 inches between the handrail and the wall;

(iii) Mounted between 34 and 38 inches above the ramp surface; and

(iv) Rounded at the ends or returned smoothly to the floor, wall, or post.

(F) Have curbs, walls, railings, or projecting surfaces that prevent people from slipping off the ramp if the ramp or landing has a drop off. Curbs must be a minimum of 2 inches high;

(G) Be designed so water does not accumulate on walking surfaces; and

(H) Have non-skid surfaces.

(s) EMERGENCY EXITS. There must be a second safe means of exit from all sleeping rooms. A provider whose sleeping room is above the first floor may be required to demonstrate at the time of licensure, renewal, or inspection, an evacuation drill from the provider's sleeping room using the secondary exit.

(t) FLASHLIGHT. There must be at least one plug-in, rechargeable flashlight in good functional condition available on each floor of the home for emergency lighting.
(u) SMOKING. If smoking is allowed in a home, the licensee must adopt house policies that restrict smoking to designated areas.

(A) Smoking is prohibited in:

(i) Any bedroom including that of the residents, licensee, resident manager, any other caregiver, occupant, or visitor;
(ii) Any room where oxygen is used; and
(iii) Anywhere flammable materials are stored.

(B) Ashtrays of noncombustible material and safe design must be provided in areas where smoking is permitted.

(v) EMERGENCY PREPAREDNESS PLAN. A licensee must develop and maintain a written emergency preparedness plan for the protection of all occupants in the home in the event of an emergency or disaster.

(A) The written emergency plan must:

(i) Include an evaluation of potential emergency hazards including but not limited to:

(I) Prolonged power failure or water or sewer loss;
(II) Fire, smoke, or explosion;
(III) Structural damage;
(IV) Hurricane, tornado, tsunami, volcanic eruption, flood, or earthquake;
(V) Chemical spill or leak; and
(VI) Pandemic.

(ii) Include an outline of the caregiver’s duties during an evacuation;

(iii) Consider the needs of all occupants of the home including but not limited to:

(I) Access to medical records necessary to provide services and treatment;
(II) Access to pharmaceuticals, medical supplies, and equipment during and after an evacuation; and
(III) Behavioral support needs.

(iv) Include provisions and supplies sufficient to shelter in place for a minimum of three days without electricity, running water, or replacement staff; and

(v) Planned relocation sites.

(B) The licensee must notify the Department or the local licensing authority of the homes status in the event of an emergency that requires evacuation and during any emergent situation when requested.

(C) The licensee must re-evaluate the emergency preparedness plan at least annually and whenever there is a significant change in the home.

Requirements for Ventilator-Assisted Care

Adult foster homes that provide ventilator-assisted care for residents must meet the following requirements in addition to the other requirements set forth in these rules:

....

(7) FACILITY STANDARDS. An applicant and licensee must meet and maintain compliance with the above standards. In addition:

(a) The residents’ bedrooms must be a minimum of 100 square feet, or larger if necessary, to accommodate the standard requirements of the above standards, the needs of the resident, and the equipment and supplies necessary for the care and services needed by individuals requiring ventilator-assisted care.
(b) Homes that provide ventilator-assisted care for residents must have a functional, emergency back-up generator. The generator must be adequate to maintain electrical service for resident needs until regular service is restored. Hard wired, back-up generators must be installed by a licensed electrician. Back-up generators must be tested monthly and the test must be documented in the facility records.

(c) The home must have a functional, interconnected carbon monoxide and smoke alarm system with back-up batteries.

(d) The home must have a functional sprinkler system and maintenance of the sprinkler system must be completed as recommended by the manufacturer. A home that does not have a functional sprinkler system but was approved to provide ventilator-assisted care prior to ______________, must install a functional whole-home sprinkler system no later than two years later.

(e) Each resident's bedroom must have a mechanism in place that enables the resident to summon a caregiver's assistance when needed. The mechanism must be within the abilities of the resident to use. The summons must be audible in all areas of the adult foster home.

Statement of Problem and Substantiation for Public Input

Over the last several decades, adult foster homes have become a common application for reducing healthcare costs while at the same time providing higher quality of life for both regular patients and veterans alike. The concept basically involves providing healthcare as simply as just making sure that a patient receives their proper medications at the proper time, up to and including providing advanced medical care for a patient that is on a respirator, and virtually every type of situation in between. This public input proposal recommends, as a starting point, the rules as they exist for the state of Oregon for these types of situations. Oregon has had adult foster care programs in place for about two decades now. Using these rules as a starting point for developing specific code provisions for application to one or two family dwellings that house patients in an adult foster care setting, the NFPA can provide leadership in guiding both states that have yet to adopt an adult foster care program and for those who have already adopted such programs. NFPA's unique expertise in the building code arena will prove useful to many of those involved in approving requirements for the buildings in which adult foster care is provided.

Substantiation: Since one and two family dwellings are not covered in any other parts of the NFPA 5000 building code when being used as a medical facility, code provisions must be established to help provide safe and functional settings within which adult foster care can be provided. While these Oregon rules are only intended to be a starting point, and obviously, many of the Oregon provisions might be resolved as NFPA code provisions by simple reference to other provisions in the NFPA 5000 code, there is still a need for review by experts in this area.

The following link provides a brief description of what adult foster care programs are all about:

The following link explains what is expected of those that provide healthcare in the adult foster care setting:

The following link provides access to all of the rules relating to adult foster care homes in Oregon:

Submitter Information Verification

Submitter Full Name: STANLEY HARBUCK
Organization: SCHOOL OF BUILDING INSPECTION
Street Address:
Committee Statement

Resolution: The proposed language is outside the scope of NFPA 5000. This appears to be more of a state licensing issue. The proposed revisions would apply to occupancies with fewer than four residents - board and care facilities have at least four residents by definition.
27.4.4.2.5 Mall.
A roofed or covered common pedestrian area within a mall building that serves as access for two or more tenants and does not exceed three levels that are open to each other. (See 3.3.382.)

a: Enclosed Mall Concourse. A mall concourse which has less than 50% of the perimeter walls or roof open to the outer air.

b: Open mall Concourse.* A mall concourse which has 50% or more of the perimeter walls or roof open to the outer air.

Statement of Problem and Substantiation for Public Input

27.4.4.2.6 Major Tenant. A tenant space, in a mall building, with one or more main entrances from the exterior that also serve as exits and are independent of the mall. (See 3.3.382.)

Statement: The current terminology in the Codes does not make clear the different between mall structures with enclosed or open concourses. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 15:08:30 EDT 2015

Committee Statement

Resolution: CI-6513-NFPA 5000-2015
Statement: The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses. The proposed Committee Input is developed with the intent of soliciting public comment and additional review by the mall task group and is focused on the definition of open and enclosed mall concourses as well as the impact of open mall concourses on existing code requirements. Prior to the Second Draft meeting the task group will continue to meet and review the code.
requirements for open versus enclosed mall concourses and determine how the code is to be appropriately applied to either open or enclosed mall concourses. The task group is looking at areas such as egress travel, fire protection systems and protection of the mall concourse, as well as protection and presence of kiosks and equipment within the mall concourse.

It should be noted that the term 'mall' will be replaced with 'mall concourse' and 'mall building' will be replaced with 'mall structure' pending the results of revisions made by the Committee during the First Draft meeting.
Mass Notification

28.3.4 Mass Notification Risk Analysis. A Risk Analysis in accordance with section 9.6 of this code shall be conducted for new college and university buildings to determine the need for Mass Notification.

28.3.4.1 Emergency Response Plan. An emergency response plan shall be developed or modified for each College and University based on requirements of 55.2.

28.3.4.1.2 Where there is an emergency response plan in place, Mass Notification shall be implemented in accordance with the Risk Analysis to provide emergency communication required by the emergency response plan.

Statement of Problem and Substantiation for Public Input

This will point to Chapter 9 for instructions. Campus and Universities are often considered “Business Occupancies”, this is the reason for this section to point to Chapter 9.

The purpose for this Public Input seeks to provide a requirement that every new College and University campus conduct a Risk Analysis and create an Emergency Response Plan for their facility. The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security and our educational occupancies. We have learned from the recent incidents that occurred in our college/university campuses and other buildings, and have created installation guidelines to be followed for Life Safety. [Aurora, CO. Theater 2012; Columbine 1999; Virginia Tech 2007; Sandy Hook 2012; Weather Tornadoes/Storms]

NFPA 72 National Fire Alarm and Signaling Code has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the Risk Analysis and Emergency Response Plan as required in the above proposed sections.

This is NOT intended to require a Mass Notification System in every educational occupancy. There are many elements contained within a Mass Notification System, the process of the Risk Analysis will outline what is needed based on Risk and engineering study for the occupancy. It will be the responsibility of the education occupancy to react to the Risk Assessment.

An Emergency Response Plan will be needed for each educational occupancy.

Submitter Information Verification

Submitter Full Name: PAUL MARTIN
Organization: NEW YORK DIVISION OF HOMELAND
Affiliation: Center for Campus Fire Safety
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Thu Jul 02 10:58:35 EDT 2015
Committee Statement

**Resolution:** CI-6502-NFPA 5000-2015

**Statement:** New language has been added to Chapter 55 regarding conducting a risk analysis to determine the need for the installation of a mass notification system in a building. The committee is generally interested in this subject area but is seeking additional information regarding the application of new Section 55.13 specific to college and university campus buildings. A task group has been formed to further explore the issue and will be looking at the following issues prior to the Second Draft meeting:

- Qualifications of person completing risk analysis

- Feedback from college and university industry on the impact of new 55.13

- How are the provisions applied to an entire campus versus a single building, and are their implications of applying provisions for mass notification on a building by building basis only.

- Extent of application: what types of buildings should this apply to? How can the Code properly identify the type of college and university buildings that this requirement should apply to?

- Extent of the application of the required emergency plan.

- How would enforcing new 55.13 impact non-classroom buildings?
32.2.3 Tensioned-Membrane Structures.

32.2.3.1 General. In addition to the requirements of this Code, tension membrane structures shall be designed and operated in accordance with ASCE/SEI 55, Tension Membrane Structures.

32.2.3.2 Protection for Membrane Roofs.

Protection for membrane roofs for structures in climates subject to freezing temperatures and ice buildup shall be as specified in 32.2.3.4.1 or 32.2.3.4.2.

32.2.3.4.1 The roof shall be composed of two layers with an air space between the layers through which heated air can be moved to guard against ice accumulation.

32.2.3.4.2 Any approved methods that protect against ice accumulation shall be permitted.

32.2.3.3 Protection for Roof Drains.

Protection for roof drains shall be as specified in 32.2.3.3.1 and 32.2.3.3.2 or 32.2.3.3.3.

32.2.3.3.1 Roof drains shall be equipped with listed de-icing and snow-melting equipment to protect against ice buildup, which would prevent the drains from functioning.

32.2.3.3.2 The equipment specified in 32.2.3.3.1 shall be served by on-site standby electrical power in addition to the normal public service.

32.2.3.3.3 In lieu of de-icing and snow-melting equipment, any other approved methods that protect against ice accumulation shall be permitted.

Statement of Problem and Substantiation for Public Input

ASCE 55 (2010) currently governs the design of tension membrane structures. It provides minimum criteria for the design and performance of membrane-covered cable and rigid member structures, including frame structures, collectively known as tensile membrane structures. It includes permanent and temporary structures. The requirements of this standard apply whether the tensile membrane structure is independent of or attached to another structure. Consequently, it should be referenced in Chapter 32. Please note that the next edition of ASCE 55 will be merged with ASCE 17 and should be completed in time for adoption in NFPA 5000-18.

Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Street Address:
Committee Statement

Resolution: FR-7503-NFPA 5000-2015
Statement: ASCE 55 (2010) currently governs the design of tension membrane structures. It provides minimum criteria for the design and performance of membrane-covered cable and rigid member structures, including frame structures, collectively known as tensile membrane structures. It includes permanent and temporary structures. The requirements of this standard apply whether the tensile membrane structure is independent of or attached to another structure. Consequently, it should be referenced in Chapter 32. Please note that the next edition of ASCE 55 will be merged with ASCE 17 and should be completed in time for adoption in NFPA 5000-18.
32.2.4.1* General.  
In addition to the requirements of this Code, air-supported structures shall be designed and operated in accordance with ASCE/SEI 47.55, *Air Supported Tension Membrane Structures.*

Statement of Problem and Substantiation for Public Input

ASCE 17 is being merged into ASCE 55. This work should be complete in time for the 2018 NFPA 5000. It may be worthwhile for the BLD-SCM to also pick up a reference to ASCE 55 in Section 32.2.3 on Tension Membrane Structures.

Submitter Information Verification

Submitter Full Name: BONNIE MANLEY  
Organization: AMERICAN IRON AND STEEL INSTIT

Committee Statement

Resolution: FR-7504-NFPA 5000-2015  
Statement: ASCE 17 is being merged into ASCE 55. This work should be complete in time for the 2018 NFPA 5000. It may be worthwhile for the BLD-SCM to also pick up a reference to ASCE 55 in Section 32.2.3 on Tension Membrane Structures.
Public Input No. 199-NFPA 5000-2015 [ Section No. 32.14.1.2 ]

| 32.14.1.2 |
The framework of unenclosed towers extending more than 75 ft (23 m) above grade plane shall be constructed of iron, structural steel, or reinforced concrete.

Statement of Problem and Substantiation for Public Input

Iron is considered an antiquated material and not suitable for this application.

Submitter Information Verification

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Committee Statement

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33.3.2.3 Standpipes

High-rise buildings shall be equipped with a Class I standpipe system installed in accordance with NFPA 14.

Statement of Problem and Substantiation for Public Input

High-rise buildings are a unique hazard requiring specialized equipment. All other requirements for high-rise buildings are found in Chapter 33 except standpipes which clearly warrant this fire protection feature. Presently there is no requirement for standpipe systems under the high rise section of the code. One has to go to Chapter 55 to find the requirement which reads as follows: 55.4.1 New buildings shall be equipped with a Class I standpipe system installed in accordance with NFPA 14, Standard for the Installation of Standpipe and Hose Systems, where any of the following conditions exist:

1. the building is four or more stories in height, and
2. the building is more than 50 ft (15 m) above grade plane and contains intermediate stories or balconies.

While Chapter 55 requires this for buildings 50 ft or more in height, the definition of a high-rise building falls within this requirement, which should be added to Chapter 33.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 18:23:08 EDT 2015

Committee Statement

Resolution: FR-6080-NFPA 5000-2015
Statement: High-rise buildings are a unique hazard requiring specialized equipment. All other requirements for high-rise buildings are found in Chapter 33 except standpipes which clearly warrant this fire protection feature. Presently there is no requirement for standpipe systems under the high rise section of the code. One has to go to Chapter 55 to find the requirement which reads as follows: 55.4.1 New buildings shall be equipped with a Class I standpipe system installed in accordance with NFPA 14, Standard for the Installation of Standpipe and Hose Systems, where any of the following conditions exist:

1. the building is four or more stories in height
2. the building is more than 50 ft (15 m) above grade plane and contains intermediate stories or balconies.
While Chapter 55 requires this for buildings 50 ft or more in height, the definition of a high-rise building falls within this requirement, which should be added to Chapter 33.
33.3.3.1
All vertical exit stair enclosures serving the high-rise portion of the building shall be smokeproof enclosures in accordance with 11.2.3.

Statement of Problem and Substantiation for Public Input

The current wording requires all exit stairs in a high-rise building to be a smoke proof enclosure. The revised wording would permit exit stairs only serving the lower non high-rise stories of the building to be constructed a exit stairs and not the more elaborate requirements of a smoke-proof enclosure. The lower stories of many high-rise buildings are typically much larger in footprint than the high-rise portion and often contain shopping malls and assembly occupancies. The current wording requires all stairs, even those serving a two-story mall or the second floor assembly to be smoke proof enclosures even though they do not connect with the high-rise floors.

Submitter Information Verification

Submitter Full Name: JOSEPH VERSTEEG
Organization: VERSTEEG ASSOCIATES
Affiliation: Self
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 10:00:23 EDT 2015

Committee Statement

Resolution: FR-6081-NFPA 5000-2015
Statement: The current wording requires all exit stairs in a high-rise building to be a smokeproof enclosure. The revised wording would permit exit stairs that serve only the lower non high-rise stories of the building to be exempt from the more elaborate requirements of a smokeproof enclosure. The lower stories of many high-rise buildings are typically much larger in footprint (e.g., a podium building with high-rise tower) than the high-rise portion and often contain shopping malls and assembly occupancies. The current wording requires all stairs, even those serving a two-story mall or the second floor assembly to be smokeproof enclosures even though they do not connect with the high-rise floors.
Public Input No. 146-NFPA 5000-2015 [Section No. 33.3.7]

33.3.7 Elevators

33.3.7.1 Ambulance Stretcher Accommodation.

33.3.7.1.1 In buildings of more than three stories, a minimum of one elevator shall be provided for fire fighter emergency operation to all floors.

33.3.7.1.2 The elevator car shall be sized and arranged to accommodate a 2 ft × 7 ft (610 mm × 2130 mm) ambulance stretcher with minimum 5-in. (125-mm) radius corners in the horizontal, open position.

33.3.7.1.3 The elevator car shall be identified by the international symbol for emergency medical services (star of life). The symbol shall be minimum 3 in. (75 mm) in height and shall be located inside the car on both sides of the door frame.

33.3.7.2 Fire Service Access Elevator.

In buildings with an occupied floor over 120 ft (36.6 m) in height above the lowest level of fire department vehicle access, a minimum of two fire service access elevators, each having a minimum 3500 lb (1590 kg) capacity and serving every floor within the subject building, shall be provided to serve as fire service access elevators in accordance with Section 54.12.

Statement of Problem and Substantiation for Public Input

There is a requirement (33.3.7) for a Fire Service Access Elevator in a high-rise building greater than 120 feet in height but there is no requirement in the high-rise section for the ambulance stretcher accommodation. One must go to the elevator section at 54.3 to find this requirement which obviously applies to high-rises since it applies to buildings greater than 3 stories in height.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: NFPA's Building
City: State: Zip: Submittal Date: Sat Jul 04 18:28:55 EDT 2015

Committee Statement

Resolution: It would not be logical to place the requested requirement for ambulance stretcher accommodation in 33.3.7 as it is already applicable to all elevators in buildings more than three stories in height via the provisions of Section 54.3.
Public Input No. 36-NFPA 5000-2015 [ Section No. 33.3.7 ]

33.3.7 Fire Service Access Elevator.
In buildings with an occupied floor over 120 ft (36.6 m) in height above the lowest level of fire department vehicle access, a minimum of two fire service access elevators, each having a minimum 3500 lb (1590 kg) capacity and serving every floor within the subject building, shall be provided to serve as fire service access elevators in accordance with Section 54.12.

Exceptions:
(1) One fire service access elevator is permitted where the entire floor consists of a single dwelling unit.
(2) No fire access elevator is required to serve the top floor of the building where the entire floor consists of building support equipment.

Statement of Problem and Substantiation for Public Input

Pent house floors that consists of a single luxury apartment occupying the entire floor should be permitted to have one fire access elevator access. Such units are usually located at the top floors where not all elevator hoistways intended to serve. In addition, the circulation space is limit for apartment servicing which is difficult to be provided with a second fire access elevator. The top floor consisting of building support equipment should be relieved from the fire access elevator requirement since the space is primarily occupied by the building support equipment where the space does not allow for hoistway extension. Fire-fighters can always use the stair to access the mechanical floor if it is only one level.

Submitter Information Verification

Submitter Full Name: MOHAMED MOHAMED
Organization: ROLF JENSEN AND ASSOC
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jun 01 07:04:56 EDT 2015

Committee Statement

Resolution: The second fire service access elevator is needed when the first elevator is out of service. A building support equipment floor, as singled out by the submitter, might sit below an occupied roof deck and accompanying pool. the fire service access elevator needs to extend to all floors.
Egress from areas required to comply with Protection Level 1, Protection Level 2, Protection Level 3, Protection Level 4, or Protection Level 5 shall comply with 34.3.2.4, and egress from areas required to comply with Protection Level 5 shall also comply with 34.3.7.

Statement of Problem and Substantiation for Public Input

Terra did not do the legislative format correctly.

Clarifies that some base egress requirements applicable to PL-5 are contained in section 34.3.2.4 (travel distance limit, etc) but that there are also additional requirements specific to PL-5 that are in 34.3.7. Compliance with both 34.3.2.4 and 34.3.7 are required for PL-5 areas.

Submitter Information Verification

Submitter Full Name: MARTIN GRESHO
Organization: FP2 FIRE INC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 14:08:47 EDT 2015

Committee Statement

Resolution: FR-5004-NFPA 5000-2015
Statement: Clarifies that some base egress requirements applicable to PL-5 are contained in section 34.3.2.4 (travel distance limit, etc) but that there are also additional requirements specific to PL-5 that are in 34.3.7. Compliance with both 34.3.2.4 and 34.3.7 are required for PL-5 areas.
**New Section**

32.3.2.4.6 Common Path of Travel Distance Limit. The common path of travel distance from areas required to comply with Protection Level 1 through Protection Level 5 shall not exceed the distance given in Table 34.3.2.4.6, measured as required in 11.6.3.

Table 32.3.2.4.6 Common Path of Travel Distance Limits

<table>
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<tr>
<th>Hazard Level</th>
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**Additional Proposed Changes**

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<td>Complete text for adding Common Path Limit</td>
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</tr>
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</table>

**Statement of Problem and Substantiation for Public Input**

Add Common Path of Travel for Protection Level 1-5 areas
New Section after 32.3.2.4.5.

Substantiation:
In regards to egress travel distances, three (3) different travel distances are critical to safe egress. 1) Total Travel Distance to an Exit, or Exit Access Travel Distance, 2) Common Path of Travel, and 3) Dead Ends (in corridors). Each of these must be evaluated separately. The definitions of these distances are contained in 2016 NFPA 101 as follows:
3.3.82 Exit Access. That portion of a means of egress that leads to an exit.

3.3.47* Common Path of Travel. The portion of exit access that must be traversed before two separate and distinct paths of travel to two exits are available.
Dead ends are not specifically defined in NFPA 101 but are discussed in detail in §A7.5.1.5 and are adequately addressed in NFPA 400 §6.2.1.4.4, extracted from NFPA 5000§34.3.2.4.4. The limit on common path of travel for occupancies (areas) with >MAQ of hazardous materials (required to meet Protection Level 1-5 requirements) is not currently addressed in NFPA 5000, NFPA 101, NFPA 1 or NFPA 400.
NFPA 101: The regulation of areas with greater than MAQ of hazardous materials (such as PL-4 area) is outside the scope of NFPA 101 per the following response (emphasis added) that was received from the NFPA online technical question service:
Dear Martin Gresho
Special requirements for areas with hazardous materials in excess of the MAQ and protection in accordance with a specific protection level are outside the scope of NFPA 101. These requirements would be addressed in a building code or fire code. Section 7.11 only addresses those areas that have contents classified as high hazard in accordance with NFPA 101. High hazard contents, as defined in NFPA 101, are those that are likely to burn extremely quickly or where explosions are likely. If you do have an occupancy that does not have high hazard contents (as defined in NFPA 101) the common path of travel would be governed by whatever the occupancy chapter permits. If you find a more restrictive value for common path of travel in a building or fire code, then the more restrictive value would apply.

Create Date: 4/23/2014
Contact: Martin Gresho
Document Number: 101
Edition: 2012
Section: 7.11
Subject: Common Path for PL-4
Question for NFPA: The common path distance limitation for protection level 4 occupancies is not listed. What distance should be used?
NFPA 5000: Travel distance limits for Protection Level 1-5 occupancies are addressed by NFPA 5000 in §34.3.2.4.1 and dead end limits are addressed in §34.3.2.4.4, however, there are no requirements in NFPA 5000 for common path of travel in Protection Level 1-5 occupancies.
NFPA 1: Chapter 14 addresses means of egress but there are no specific requirements for hazardous materials >MAQ (PL 1-5) occupancies such as there are in NFPA 5000.

Because no specific limit for common path of travel exists, inappropriate distances could be used for this critical means of egress element.
Basis for 25 foot distance: For Hazard Levels 1-3 the primary hazard is a physical one. During fire conditions, physical hazards (which may be open or closed use or storage, can dramatically and rapidly change fire characteristics. Therefore the distance one must travel until there are two distinct paths of travel to an exit must be limited in length. 25 feet is a reasonable distance limit for such conditions.
Basis for 75 foot distance. Per NFPA 101, the common path of travel in a sprinklered industrial or storage occupancy is 100 feet (50 feet if un-sprinklered). All PL-4 and PL-5 areas are required to be sprinklered regardless, so a common path limit for a non-sprinklered PL-4, 5 area need not be developed – it is not allowed.
As a high hazard area, the common path distance for a PL-4 or PL-5 area should be less than that allowed for a storage or industrial occupancy. During normal conditions, the health hazards associated with toxic solids and liquids are required to be controlled – that is there are robust requirements for containers, piping, etc. that are already required both by NFPA 400 and applicable fire codes as well as various health hazard requirements (related to industrial hygiene) that prevent the release of toxic or highly toxic solids and liquids into occupied areas during normal operation. During a fire condition, release is possible, and egress is needed prior to the development of untenable conditions, either due to products of combustion and heat from the fire or due to release of the toxic or highly toxic solids or liquids due to a fire induced breach of their containment. The fire sprinklers would frequently be expected to eliminate a release, but that is not always the case. This possible release warrants a reduction in the 100 foot common path of travel distance from that allowed for the base occupancies, but not so much as would be required for physical hazards (PL 1-3 areas) and more than would be allowed for an un-sprinklered base occupancy (50 feet). Therefore 75 feet is a reasonable distance for the common path of travel distance for a sprinklered PL-4 health hazard area.

Submitter Information Verification

Page 698 of 863
Committee Statement

Resolution: FR-5005-NFPA 5000-2015

Statement: The Committee is in agreement with the submitter that a limit for common path of travel is needed for areas utilizing protection levels 1 through 5. Because no specific limit for common path of travel exists, inappropriate distances could be used for this critical means of egress element.

Basis for 25 foot distance: For Hazard Levels 1-3 the primary hazard is a physical one. During fire conditions, physical hazards (which may be open or closed use or storage, can dramatically and rapidly change fire characteristics. Therefore the distance one must travel until there are two distinct paths of travel to an exit must be limited in length. 25 feet is a reasonable distance limit for such conditions.

Basis for 75 foot distance. Per NFPA 101, the common path of travel in a sprinklered industrial or storage occupancy is 100 feet (50 feet if nonsprinklered). All PL-4 and PL-5 areas are required to be sprinklered regardless, so a common path limit for a nonsprinklered PL-4, PL-5 area need not be developed – it is not allowed.

As a high hazard area, the common path distance for a PL-4 or PL-5 area should be less than that allowed for a storage or industrial occupancy. During normal conditions, the health hazards associated with toxic solids and liquids are required to be controlled – that is there are robust requirements for containers, piping, etc. that are already required both by NFPA 400 and applicable fire codes as well as various health hazard requirements (related to industrial hygiene) that prevent the release of toxic or highly toxic solids and liquids into occupied areas during normal operation. During a fire condition, release is possible, and egress is needed prior to the development of untenable conditions, either due to products of combustion and heat from the fire or due to release of the toxic or highly toxic solids or liquids due to a fire induced breach of their containment. The fire sprinklers would frequently be expected to eliminate a release, but that is not always the case. This possible release warrants a reduction in the 100 foot common path of travel distance from that allowed for the base occupancies, but not so much as would be required for physical hazards (PL 1-3 areas) and more than would be allowed for a nonsprinklered base occupancy (50 feet). Therefore 75 feet is a reasonable distance for the common path of travel distance for a sprinklered PL-4 health hazard area.

In addition, the committee changed the term 'hazard' to 'protection' to make the terminology consistent.
Add Common Path of Travel for Protection Level 1-5 areas

New Section after 32.3.2.4.5.

32.3.2.4.6 Common Path of Travel Distance Limit. The common path of travel distance from areas required to comply with Protection Level 1 through Protection Level 5 shall not exceed the distance given in Table 34.3.2.4.6, measured as required in 11.6.3.

Table 32.3.2.4.6 Common Path of Travel Distance Limits

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</tr>
</tbody>
</table>

Substantiation:

In regards to egress travel distances, three (3) different travel distances are critical to safe egress. 1) Total Travel Distance to an Exit, or Exit Access Travel Distance, 2) Common Path of Travel, and 3) Dead Ends (in corridors). Each of these must be evaluated separately. The definitions of these distances are contained in 2016 NFPA 101 as follows:

3.3.82 Exit Access. That portion of a means of egress that leads to an exit.

3.3.47* Common Path of Travel. The portion of exit access that must be traversed before two separate and distinct paths of travel to two exits are available.

Dead ends are not specifically defined in NFPA 101 but are discussed in detail in §A7.5.1.5 and are adequately addressed in NFPA 400 §6.2.1.4.4, extracted from NFPA 5000§34.3.2.4.4.

The limit on common path of travel for occupancies (areas) with >MAQ of hazardous materials (required to meet Protection Level 1-5 requirements) is not currently addressed in NFPA 5000, NFPA 101, NFPA 1 or NFPA 400.

NFPA 101: The regulation of areas with greater than MAQ of hazardous materials (such as PL-4 area) is outside the scope of NFPA 101 per the following response (emphasis added) that was received from the NFPA online technical question service:

Dear Martin Gresho

Special requirements for areas with hazardous materials in excess of the MAQ and protection in accordance with a specific protection level are outside the scope of NFPA 101. These requirements would be addressed in a building code or fire code.

Section 7.11 only addresses those areas that have contents classified as high hazard in accordance with NFPA 101. High hazard contents, as defined in NFPA 101, are those that are likely to burn extremely quickly or where explosions are likely. If you do have an
occupancy that does not have high hazard contents (as defined in NFPA 101) the common path of travel would be governed by whatever the occupancy chapter permits.

If you find a more restrictive value for common path of travel in a building or fire code, then the more restrictive value would apply.

Create Date: 4/23/2014
Contact: Martin Gresho
Document Number: 101
Edition: 2012
Section: 7.11
Subject: Common Path for PL-4

Question for NFPA: The common path distance limitation for protection level 4 occupancies is not listed. What distance should be used?

**NFPA 5000**: Travel distance limits for Protection Level 1-5 occupancies are addressed by NFPA 5000 in §34.3.2.4.1 and dead end limits are addressed in §34.3.2.4.4, however, there are no requirements in NFPA 5000 for common path of travel in Protection Level 1-5 occupancies.

**NFPA 1**: Chapter 14 addresses means of egress but there are no specific requirements for hazardous materials >MAQ (PL 1-5) occupancies such as there are in NFPA 5000.

Because no specific limit for common path of travel exists, inappropriate distances could be used for this critical means of egress element.

**Basis for 25 foot distance**: For Hazard Levels 1-3 the primary hazard is a physical one. During fire conditions, physical hazards (which may be open or closed use or storage, can dramatically and rapidly change fire characteristics. Therefore the distance one must travel until there are two distinct paths of travel to an exit must be limited in length. 25 feet is a reasonable distance limit for such conditions.

**Basis for 75 foot distance**: Per NFPA 101, the common path of travel in a sprinklered industrial or storage occupancy is 100 feet (50 feet if un-sprinklered). All PL-4 and PL-5 areas are required to be sprinklered regardless, so a common path limit for a non-sprinklered PL-4, 5 area need not be developed – it is not allowed.

As a high hazard area, the common path distance for a PL-4 or PL-5 area should be less than that allowed for a storage or industrial occupancy. During normal conditions, the health hazards associated with toxic solids and liquids are required to be controlled – that is there are robust requirements for containers, piping, etc. that are already required both by NFPA 400 and applicable fire codes as well as various health hazard requirements (related to industrial hygiene) that prevent the release of toxic or highly toxic solids and liquids into occupied areas during normal operation. During a fire condition, release is possible, and egress is needed prior to the development of untenable conditions, either due to products of combustion and heat from the fire or due to release of the toxic or highly toxic solids or liquids due to a fire induced breach of their containment. The fire sprinklers would frequently be expected to eliminate a release, but that is not always the case. This possible release warrants a reduction in the 100 foot common path of travel distance from that allowed for the base occupancies, but not so much as would be required for physical hazards (PL 1-3 areas) and more than would be allowed for an un-sprinklered base occupancy (50 feet).
Therefore 75 feet is a reasonable distance for the common path of travel distance for a sprinklered PL-4 health hazard area.
Public Input No. 96-NFPA 5000-2015 [Section No. 35.1.2.3]

35.1.2.3 One-and Two-Family Dwellings.

One- and two-family dwellings shall be permitted to be designed and constructed in accordance with the following reference documents, subject to the limitations therein:

1. PCA 100, Prescriptive Design of Exterior Concrete Walls for One- and Two-Family Dwellings
2. ACI 530/ASCE 5/TMS 402, Building Code Requirements for Masonry Structures, Chapter 5
3. AISI S230, Standard for Cold-Formed Steel Framing — Prescriptive Method for One- and Two-Family Dwellings
4. ANSI/AWC WFCM, Wood Frame Construction Manual for One- and Two-Family Dwellings
5. ICC-600, Standard for Residential Construction in High Wind Regions
6. IRC, International Residential Code, Chapter 2, Section R301, R302.13, and Chapters 4 through 8

Statement of Problem and Substantiation for Public Input

Previous editions of the IRC had lightweight floor framing protection in Chapter 5, specifically R501.3. The 2018 IRC moved the provisions for protecting lightweight floor framing to R302.13. While NFPA 5000 and the IRC requires fire sprinklers in one and two family dwellings, by inserting R302.13 into the structural provisions of NFPA 5000 this provides floor protection redundancy.

Submitter Information Verification

Submitter Full Name: JEFFREY HUGO
Organization: NATIONAL FIRE SPRINKLER ASSOCIATION
Affiliation: NATIONAL FIRE SPRINKLER ASSOCIATION
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 13:59:29 EDT 2015

Committee Statement

Resolution: Other parts of the IRC have fire protection features. The committee does not see the need to add such language to the structural section of the code.
35.1.2.8.3 Steel.
The deflection of steel structural members shall not exceed that permitted by the following, as applicable:

1. AISC 360, *Specification for Structural Steel Buildings*
2. AISI-S100, *North American Specification for the Design of Cold-Formed Steel Structural Members*
3. ASCE/SEI 8, *Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members*
4. SJI CJ, *Standard Specifications for Composite Steel Joists, CJ-Series*
5. SJI JG -100, *Standard Specifications, Specification for Joist Girders*
7. SJL LH/DLH
8. *Standard Specifications for Longspan Steel Joists, LH-Series*
9. and Deep Longspan Steel Joists
10. DLH-Series, *Open Web Steel Joists and for Joist Girders*

**Statement of Problem and Substantiation for Public Input**

The 2015 edition (44th Edition) of the combined SJI-100, Standard Specification for K-Series, LH-Series and DLH-Series Open Web Steel Joists and for Joist Girders, represents a major change in the presentation of the SJI specifications. Previously there were three separate specifications (all found in the 43rd Edition), covering K-Series, LH/DLH-Series and Joist Girders, each one an ANSI standard. The newly completed combined standard represents a major simplification for the specifying professional.

**Related Public Inputs for This Document**

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<td>Public Input No. 203-NFPA 5000-2015 [Section No. 2.3.32]</td>
<td>Update to SJI standards.</td>
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**Submitter Information Verification**

Submitter Full Name: BONNIE MANLEY  
Organization: AMERICAN IRON AND STEEL INSTIT
Committee Statement

Resolution: FR-7506-NFPA 5000-2015

Statement: The 2015 edition (44th Edition) of the combined SJI-100, Standard Specification for K-Series, LH-Series and DLH-Series Open Web Steel Joists and for Joist Girders, represents a major change in the presentation of the SJI specifications. Previously there were three separate specifications (all found in the 43rd Edition), covering K-Series, LH/DLH-Series and Joist Girders, each one an ANSI standard. The newly completed combined standard represents a major simplification for the specifying professional.
38.5.2.1 Tests for Moderate Hail.

All roof assemblies installed in locations classified as moderate hail exposure shall be tested and classified in accordance with one of the following:

1. They shall be tested and classified as moderate hail (MH) or severe hail (SH) in accordance with FM 4470.

2. They shall be tested and classified as Class 2, Class 3, or Class 4 in accordance with UL 2218, *Standard for Impact Resistance of Prepared Roof Covering Materials*.

3. They shall be tested and listed as Class 2, Class 3, or Class 4 in accordance with ANSI/ FM 4473, *Test Standard for Specification Test Protocol for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls*.

**Statement of Problem and Substantiation for Public Input**

Updating existing reference which is now an ANSI standard.

**Related Public Inputs for This Document**

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**Submitter Information Verification**

Submitter Full Name: RICHARD DAVIS  
Organization: FM GLOBAL  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Jul 06 12:41:43 EDT 2015

**Committee Statement**

Resolution: FR-7507-NFPA 5000-2015  
Statement: Updating existing reference which is now an ANSI standard.
38.5.2.2 Tests for Severe Hail.

All roof assemblies installed in locations classified as severe hail exposure shall be tested and classified in accordance with one of the following:

1. They shall be tested and classified as severe hail (SH) in accordance with FM 4470.
2. They shall be tested and classified as Class 3 or Class 4 in accordance with UL 2218.
3. They shall be tested and listed as Class 3 or Class 4 in accordance with ANSI/ FM 4473.

Statement of Problem and Substantiation for Public Input

Updating reference, which is now ANSI accepted.

Submitter Information Verification

Submitter Full Name: RICHARD DAVIS
Organization: FM GLOBAL
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 12:46:13 EDT 2015

Committee Statement

Resolution: FR-7508-NFPA 5000-2015
Statement: Updating reference, which is now ANSI accepted.
38.9.7.8 Wind Requirements.

38.9.7.8.1
Through-fastened metal panel roof assemblies applied to a solid or closely fitted deck shall be tested for wind resistance in accordance with one of the following applicable tests:

2. FM 4471, Approval Standard for Class I Panel Roofs
3. ANSI/UL 580, Standard for Tests for Uplift Resistance of Roof Assemblies
4. ANSI/UL 1897, Standard for Uplift Tests for Roof Covering Systems

38.9.7.8.2*
Except as noted in 38.9.7.8.3, standing seam metal panel roof assemblies, where the roof functions as the roof deck and roof covering and provides both weather protection and support for loads, the structural metal panel roof system shall be tested for wind resistance, where the test specimen contains not less than three full panel widths and not less than four full panel spans (five structural elements) in accordance with this section. Structural standing seam metal panel roof systems shall be tested in accordance with ASTM E 1592, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference or FM 4474. Structural through-fastened metal panel roof systems shall be tested in accordance with one of the following:

1. ASTM E 1592
2. FM 4471, Approval Standard for Class I Panel Roofs
3. ANSI/UL 580, Standard for Tests for Uplift Resistance of Roof Assemblies

38.9.7.8.3
Metal roofs constructed of cold-formed steel, shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 44.7.

Statement of Problem and Substantiation for Public Input

This proposal makes several corrections to the wind resistance testing requirements for metal panel roofs. FM 4474 is referenced in lieu of FM 4471 and ASTM E1592 is deleted as a referenced for metal panel roof systems applied to a deck. Additionally, the requirement for the test specimen size for standing seam metal panel roof assemblies is recommended for deletion -- the provisions of the adopted test standards are sufficient.

Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Committee Statement

**Resolution:** FR-7509-NFPA 5000-2015

**Statement:** This proposal makes several corrections to the wind resistance testing requirements for metal panel roofs. FM 4474 is referenced in lieu of FM 4471 and ASTM E1592 is deleted as a referenced for metal panel roof systems applied to a deck. Additionally, the requirement for the test specimen size for standing seam metal panel roof assemblies is recommended for deletion -- the provisions of the adopted test standards are sufficient.
Public Input No. 50-NFPA 5000-2015 [Section No. 39.8.2]

39.8.2 Flood Hazard Areas Subject to High-Velocity Wave Action and the Coastal A Zone.
The use of piers, posts, columns, and piles shall be permitted. The use of structural fill, slabs-on-ground, and foundation walls shall be prohibited. Walls serving as shear walls shall be permitted, provided that they comply with the requirements of 4.5.4-12 of ASCE/SEI 24.

Statement of Problem and Substantiation for Public Input

ASCE 24 was revised and republished in 2014. The proposal updates the section in ASCE 24-14 referred to for specifications for shearwalls.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
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<tbody>
<tr>
<td>Public Input No. 28-NFPA 5000-2015 [Section No. 2.3.7]</td>
<td>No. 28 updates the edition of ASCE 24 to 2014</td>
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Submitter Information Verification

Submitter Full Name: Rebecca Quinn
Organization: RCQuinn Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jun 20 16:56:38 EDT 2015

Committee Statement

Resolution: FR-7511-NFPA 5000-2015
Statement: ASCE 24 was revised and republished in 2014. The proposal updates the section in ASCE 24-14 referred to for specifications for shearwalls.
39.11.1.1 Flood Openings.
Walls forming enclosed areas below the lowest floor shall be equipped with flood openings that allow the automatic entry and exit of floodwaters. Flood openings shall be installed in conformance with 2.7.3 of ASCE/SEI 24. The following types of flood openings shall be permitted:

(1) Flood openings complying with the requirements of 2.6.7.2.1 of ASCE/SEI 24, for which the certification of 39.12.3.1.1 shall not be required.

(2) Flood openings complying with the requirements of 2.6.7.2.2 and 4.6.2 of ASCE/SEI 24, for which the certification of 39.12.3.1.1 shall be required.

Statement of Problem and Substantiation for Public Input
ASCE 24 was revised and republished in 2014. All specifications for installation of flood openings were moved to a new section 2.7.3. The proposal updates the sections in ASCE 24-14 referred to for both nonengineered flood openings (certification not required) and for engineered flood openings (certification required).

Related Public Inputs for This Document

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<td>Public Input No. 52-NFPA 5000-2015 [Section No. 39.12.3.1.1]</td>
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Submitter Information Verification

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<td>Rebecca Quinn</td>
</tr>
<tr>
<td>Organization:</td>
<td>RCQuinn Consulting</td>
</tr>
<tr>
<td>Affiliation:</td>
<td>Federal Emergency Management Agency, Building</td>
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<td>Street Address:</td>
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<td>Submittal Date:</td>
<td>Sat Jun 20 17:01:37 EDT 2015</td>
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Committee Statement

Resolution: The committee is unclear as to the impact of the new section from ASCE 24. It is requested that the submitter clarify the intent of the flood opening design concept.
39.12.3.1.1 Flood Opening Certification.
For fully enclosed areas below the DFE not meeting the flood opening requirements of 2.6.7.2.1 of ASCE/SEI 24, a registered architect or licensed engineer shall prepare a certification that the flood openings will allow for the automatic entry and exit of floodwaters, will allow the equalization of hydrostatic forces, and will meet the requirements of 2.6.7.2.2 and 4.6.2 of ASCE/SEI 24.

Statement of Problem and Substantiation for Public Input
ASCE 24 was revised and republished in 2014. The proposal updates the sections in ASCE 24-14 referred to for both nonengineered flood openings (certification not required) and for engineered flood openings (certification required).

Related Public Inputs for This Document

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<td>Public Input No. 51-NFPA 5000-2015 [Section No. 39.11.1.1]</td>
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Submitter Information Verification

Submitter Full Name: Rebecca Quinn
Organization: RCQuinn Consulting
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Sat Jun 20 17:05:28 EDT 2015

Committee Statement

Resolution: See committee action on PI 51. This will also avoid any inconsistency in the referenced sections of the code.
40.3.10 Steel Construction.

Structural tests and inspections for steel materials, fabrication, and erection shall be as required by the following:

(1) Structural steel construction shall comply with AISC 360 and AISC 341, as applicable.
(2) Cold-formed steel light-frame construction shall comply with Table 40.3.10(a) - AISI S240.
(3) Steel deck construction shall comply with SDI QA/QC.
(4) Other steel construction shall comply with Table 40.3.10(b).

Table 40.3.10(a) - Cold-Formed Steel Light-Frame Construction

<table>
<thead>
<tr>
<th>Item</th>
<th>Scope (frequency determined by RDP responsible for design)</th>
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<tbody>
<tr>
<td>Steel construction quality control review</td>
<td>Review contractor’s field quality control procedures. Review frequency and scope of field testing and inspections.</td>
</tr>
<tr>
<td>Fabricator certification/quality control procedures</td>
<td>Review each fabricator’s quality control procedures.</td>
</tr>
<tr>
<td>Open web steel joists</td>
<td>Inspect for size, placement, bridging, bearing, and connection to structure. Visually inspect all field welds of a minimum of 5 percent of the joists, randomly selected.</td>
</tr>
<tr>
<td>Expansion and adhesive anchors</td>
<td>Review installation procedures for both mechanical anchors and adhesive anchors. Verify that materials are suitable for job conditions.</td>
</tr>
<tr>
<td>Field correction of fabricated items</td>
<td>Review documentation of repair approved by the RDP responsible for design, and verify completion of repairs.</td>
</tr>
</tbody>
</table>

Table 40.3.10(b) - Other Steel Construction

<table>
<thead>
<tr>
<th>Item</th>
<th>Scope (frequency determined by RDP responsible for design)</th>
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</thead>
<tbody>
<tr>
<td>Steel construction quality control review</td>
<td>Review contractor’s field quality control procedures. Review frequency and scope of field testing and inspections.</td>
</tr>
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<td>Fabricator certification/quality control procedures</td>
<td>Review each fabricator’s quality control procedures.</td>
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<td>Review installation procedures for both mechanical anchors and adhesive anchors. Verify that materials are suitable for job conditions.</td>
</tr>
<tr>
<td>Field correction of fabricated items</td>
<td>Review documentation of repair approved by the RDP responsible for design, and verify completion of repairs.</td>
</tr>
</tbody>
</table>
Statement of Problem and Substantiation for Public Input

The AISI Committee on Framing Standards has developed AISI S240, North American Standard for Cold-Formed Steel Structural Framing, to address requirements for construction with cold-formed steel structural framing that are common to prescriptive and engineered design. This standard is intended for adoption and use in the United States, Canada and Mexico and integrates the following AISI standards: AISI S200-12, AISI S210-07 (2012), AISI S211-07(2012), AISI S212-07(2012), AISI S213-07w/S1-09(2012), and AISI S214-12.

New to AISI S240, Chapter D provides minimum requirements for quality control and quality assurance for material control and installation for cold-formed steel light-frame construction. Material control refers to the general oversight of the materials by the component manufacturer and installer and involves procedures for storage, release and movement of materials. Throughout the manufacturing and construction processes, including the associated inspections, materials are identified and protected from degradation. Minimum observation and inspection tasks deemed necessary to ensure quality cold-formed steel light frame construction are specified clearly within the new chapter.

The Chapter D requirements are patterned after similar requirements developed by the American Institute of Steel Construction for structural steel and the Steel Deck Institute for cold-formed steel deck.

Related Public Inputs for This Document

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<td>Update to AISI standards.</td>
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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 10:29:56 EDT 2015

Committee Statement

Resolution: FR-7512-NFPA 5000-2015
Statement: The AISI Committee on Framing Standards has developed AISI S240, North American Standard for Cold-Formed Steel Structural Framing, to address requirements for construction with cold-formed steel structural framing that are common to prescriptive and engineered design. Table 40.3.10(a) has been removed and Table 40.3.10(b) was updated and relabeled as Table 40.3.10(a) to reflect the revised AISI standards.
41.2.2.1
The design and construction of slabs-on-ground, grade, that transmit vertical loads or lateral forces from other parts of the structure to the soil shall comply with ACI 318 and Section 41.6.

Statement of Problem and Substantiation for Public Input

This revises the text to standard terminology. Consideration should be given to making this a global change in chapter 41.

Related Public Inputs for This Document

<table>
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<tr>
<th>Related Input</th>
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Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 18:31:25 EDT 2015

Committee Statement

Resolution: Both terms (ground and grade) are used interchangeably. The ACI Standard refers to it as slab on ground. See ACI 360R-10.
41.6 Slabs-on-Ground.
The provisions of this section shall apply to all concrete slabs-on-ground grade.

41.6.1 Durability.
Concrete used in slabs-on-ground grade shall comply with the durability requirements of ACI 318.

41.6.2 Minimum Thickness.
The minimum thickness of slabs-on-ground grade shall be 3 1/2 in. (90 mm).

41.6.3 Vapor Retarder.

41.6.3.1 A vapor retarder having a perm rating not exceeding 0.5 or a 6 mil (0.15 mm) thickness of polyethylene shall be placed between the top of the subgrade or base material and the bottom of the slab.

41.6.3.2 Joints in the vapor retarder shall be lapped a minimum of 6 in. (150 mm) and taped.

41.6.3.3 A vapor retarder shall not be required to be provided under any of the following conditions:

(1) Where local site conditions have been approved
(2) Where the slab is not enclosed within a building and will not be enclosed at a later date
(3) In occupancies where migration of moisture through the slab is not detrimental to the intended use of the building
(4) In unheated, detached buildings accessory to one- and two-family dwellings
(5) In unheated storage rooms of less than 70 ft² (6.5 m²) in one- and two-family dwellings

Statement of Problem and Substantiation for Public Input

This revises the text to standard terminology. Consideration should be given to making this a global change in Chapter 41.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Committee Statement

Resolution: Both terms (ground and grade) are used interchangeably. The ACI Standard refers to it as slab on ground. See ACI 360R-10.
Public Input No. 149-NFPA 5000-2015 [Section No. 41.6.3.1]

41.6.3.1
A vapor retarder having a perm rating not exceeding 0.5 or a 6 mil (0.15 mm) thickness of polyethylene shall be placed between the top of the subgrade or base material and the bottom of the slab.

Statement of Problem and Substantiation for Public Input
To be consistent with the energy code. 6 mil of polyethylene will comply with this change.

Submitter Information Verification
Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA’s Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 18:39:06 EDT 2015

Committee Statement
Resolution: The substantiation does not provide specific comment or justification for the proposed change. The committee did create a CI related to this subject in order to solicit further comment on the subject. Refer to CI # 7513.
42.1 General.

Aluminum construction shall be designed and constructed in accordance with approved standards. Structural aluminum shall comply with AA ADM 1, Sheet metal shall comply with AA ASM 35.

Statement of Problem and Substantiation for Public Input

There are no standards listed for this chapter. This adds appropriate standards. If revised, chapter 2, Referenced Standards should be revised to add Aluminum Association, Aluminum Design Manual Part 1, 2015, and Aluminum Association, Specification for Aluminum Sheet Metal Work.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 18:41:33 EDT 2015

Committee Statement

Resolution: FR-7514-NFPA 5000-2015
Statement: The current language does not reference any specific standards. This FR adds appropriate standards.

An update to chapter 2, Referenced Standards was also made to add Aluminum Association, Aluminum Design Manual Part 1, 2015, and Aluminum Association, Specification for Aluminum Sheet Metal Work (ASM-35)
44.2 Structural Steel Construction.

44.2.1* General.
The design, fabrication, and erection of structural steel for buildings and other structures shall be in accordance with AISC 360, Specification for Structural Steel Buildings.

44.2.2 Seismic Design Category B and Seismic Design Category C Seismic Design.

44.2.2.1 Structural steel seismic force-resisting systems. The design, detailing, fabrication and erection of structural steel seismic force-resisting systems shall be in accordance with the provisions of this section.

44.2.2.1 Seismic Design Category B or Seismic Design Category C.

A. Structural steel buildings assigned to Seismic Design Category B and/or Seismic Design Category C shall be of any construction permitted in AISC 360.

44.2.2.2 B.

Where a response modification coefficient, $R$, in accordance with ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures, Table 12.2-1, is used for the design of structural steel structures, buildings assigned to Seismic Design Category B or Seismic Design Category C, the structural steel force-resisting system shall be designed and detailed in accordance with the provisions of AISC 341, Seismic Provisions for Structural Steel Buildings, except as permitted in 44.2.2.1.

44.2.2.3 C.

In ASCE/SEI 7, Table 12.2-1, the response modification coefficient, $R$, designated for structural steel systems not specifically detailed for seismic resistance, excluding cantilever column systems shall be permitted to be used for systems designed and detailed in accordance with the provisions of AISC 360 only.

44.2.3 Seismic Design Category D Through Seismic Design Category E, or Seismic Design Category F.

Structural steel force-resisting systems in structural steel buildings assigned to Seismic Design Category D through Seismic Design Category E, or Seismic Design Category F shall be designed and detailed in accordance with AISC 341, except as permitted in ASCE/SEI 7, Table 15.4.1.

44.2.2.2 Structural Steel Members. The design, detailing, fabrication and erection of structural steel members in seismic force-resisting systems other than those covered in Section 44.2.2.1, including struts, collectors, chords and foundation elements, shall be in accordance with AISC 341 where either of the following applies:

1. The structure is assigned to Seismic Design Category D, Seismic Design Category E or Seismic Design Category F, except as permitted in ASCE 7, Table 15.4-1.

2. A response modification coefficient, $R$, greater than 3 in accordance with ASCE 7, Table 12.2-1, is used for the design of the structure assigned to Seismic Design Category B or Seismic Design Category C.
The modifications to this section clarify the design and detailing requirements for complete structural steel seismic force-resisting systems (SFRS) and structural steel members used in other SFRS.

In Section 44.2.1, the intent is for all structural steel members to be designed, fabricated and erected in accordance with AISC 360. Within the seismic design section, the distinction was drawn between structural steel seismic-force resisting systems, which refer to the sixteen structural steel systems currently listed in ASCE 7-10, Table 12.2-1, and structural steel members that work as struts, collectors, chords and foundation elements in seismic-force resisting systems composed primarily of other structural materials. These structural steel members are intended to be designed and detailed in accordance with AISC 341, if they are used in a structural in a high seismic area (SDC D, E or F) or they are utilized in a system that relies heavily on non-elastic energy dissipation, in this case chosen to be a system with a response modification coefficient, R, greater than 3.

### Related Public Inputs for This Document

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<th>Relationship</th>
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### Submitter Information Verification

**Submitter Full Name:** BONNIE MANLEY  
**Organization:** AMERICAN IRON AND STEEL INSTIT  
**Affiliation:** AISC  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Jul 06 13:05:29 EDT 2015

### Committee Statement

**Resolution:** FR-7515-NFPA 5000-2015  
**Statement:** The modifications to this section clarify the design and detailing requirements for complete structural steel seismic force-resisting systems (SFRS) and structural steel members used in other SFRS.

In Section 44.2.1, the intent is for all structural steel members to be designed, fabricated and erected in accordance with AISC 360. Within the seismic design section, the distinction was drawn between structural steel seismic-force resisting systems, which refer to the sixteen structural steel systems currently listed in ASCE 7-10, Table 12.2-1, and structural steel members that work as struts, collectors, chords and foundation elements in seismic-force resisting systems composed primarily of other structural materials. These structural steel members are intended to be designed and detailed in accordance with AISC 341, if they are used in a structural in a high seismic area (SDC D, E or F) or they are utilized in a system that relies heavily on non-elastic energy dissipation, in this case chosen to be a system with a response modification coefficient, R, greater than 3.
Public Input No. 197-NFPA 5000-2015 [Section No. 44.3]

44.3 Composite Structural Steel and Concrete Construction.

44.3.1 General.
Systems of structural steel members acting compositely with reinforced concrete shall be designed in accordance with AISC 360 and ACI 318, Building Code Requirements for Structural Concrete, excluding ACI 318, Chapter 22.

44.3.2 Seismic Requirements for Composite Structural Steel and Concrete Construction.
Where a response modification coefficient, \( R \), in accordance with ASCE/SEI 7, Table 12.2-1, is used as part of a system of structural steel acting compositely with reinforced concrete, the structure shall be designed and detailed in accordance with the provisions of AISC 341.

Statement of Problem and Substantiation for Public Input

This proposal editorially modifies the language in Section 44.3.1 to keep it consistent with changes recommended in Section 44.2. Please note that the reference to ACI 318, Chapter 22 may need to be updated depending upon which edition of ACI is adopted for inclusion in NFPA 5000-18.

Related Public Inputs for This Document

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<tr>
<td>Public Input No. 196-NFPA 5000-2015 [Section No. 44.2]</td>
<td>Updates to AISC requirements.</td>
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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Affiliation: AISC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 13:24:35 EDT 2015

Committee Statement

Resolution: FR-7516-NFPA 5000-2015
Statement: This proposal editorially modifies the language in Section 44.3.1 to keep it consistent with changes recommended in Section 44.2. Please note that the reference to ACI 318, Chapter 22 may need to be updated depending upon which edition of ACI is adopted for inclusion in NFPA 5000-18.
44.4— Open Web Steel Joists and Joist Girders.

The design, manufacture, and use of open web steel joists and joist girders shall be in accordance with one of the following Steel Joist Institute (SJI) specifications: SJI CJ SJI-100, Standard Specification for Composite Steel Joists, CJ K-Series, LH-Series.

- SJI JG, Standard Specification for Joist Girders

Statement of Problem and Substantiation for Public Input

The 2015 edition (44th Edition) of the combined SJI-100, Standard Specification for K-Series, LH-Series and DLH-Series Open Web Steel Joists and for Joist Girders, represents a major change in the presentation of the SJI specifications. Previously there were three separate specifications (all found in the 43rd Edition), covering K-Series, LH/DLH-Series and Joist Girders, each one an ANSI standard. The newly completed combined standard represents a major simplification for the specifying professional.

In addition to this overall change, below is a summary of substantive, noteworthy changes found in the specification in the 44th Edition:
1. For concentrated loads, the 100 pound allowance, provided that certain conditions are met, which had previously just been in the COSP is now included in the specification. A new requirement is that, for known concentrated load locations, the joist shall be designed such that it does not require field applied web members.
2. The reduction factor, Q, for crimped-end angle web members is now applicable to all crimped-end angles intersecting at the first bottom chord panel point.
3. For built-up web members comprised of two interconnected shapes, a modified slenderness ratio has been introduced.
4. Changes have been made to the k factors for web and chord slenderness. The k factor has been reduced for out of plane slenderness of top and bottom chords, and the k factors for K-Series now match those of LH/DLH-Series joists.
5. The K-Series (including KCS) bending exemption for interior panels of less than 24 inches has been removed.
6. Joist Girder redundant web members in modified Warren web configuration that support direct loads have an additional design axial load of ½ of 1 % of the top chord axial force.
7. Existing criteria for uncrimped single angle web members, which had previously only been published internally in the SJI Design Guides, are now included in the specification.
8. The criteria for joint eccentricity have been merged to create criteria based upon the number of web components, but independent of the joist series.
9. Criteria for bearing seat and bearing plate width that had previously been only in the COSP is now also in the specification.
10. The criteria for bearing seat depth, to achieve the end reaction farther over the support, has been redone for greater clarity.
11. The existing “Minkoff” equation for determination of Erection bridging requirements has now been added to the specification.
12. The bridging criteria is unchanged, but the previously separate K and LH tables have now been merged.
13. Connection welds have been added to certain bridging tables.
14. The previous specification had almost no mention of seismic loads, so some language has been added to this version in Section 104.13.

A technically complete draft of the new SJI-100 (2015) is available for review.

**Related Public Inputs for This Document**

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<td>Public Input No. 204-NFPA 5000-2015 [Section No. 35.1.2.8.3]</td>
<td>Update to SJI standards.</td>
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**Submitter Information Verification**

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Affiliation: SJI
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 14:08:23 EDT 2015

**Committee Statement**

Resolution: FR-7518-NFPA 5000-2015
Statement: The 2015 edition (44th Edition) of the combined SJI-100, Standard Specification for K-Series, LH-Series and DLH-Series Open Web Steel Joists and for Joist Girders, represents a major change in the presentation of the SJI specifications. Previously there were three separate specifications (all found in the 43rd Edition), covering K-Series, LH/DLH-Series and Joist Girders, each one an ANSI standard. The newly completed combined standard represents a major simplification for the specifying professional.
**Public Input No. 208-NFPA 5000-2015 [Section No. 44.6]**

**44.6** Industrial Steel Storage Racks.

**44.6.1** The design, testing, and utilization of industrial steel storage racks, made of cold-formed or hot-rolled steel structural members, at or below grade, shall be in accordance with ANSI MH16.1, Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks.

**44.6.2** Where required by ASCE/SEI 7, the seismic design of steel storage racks shall also be in accordance with the requirements of Section 15.5.3 of ASCE/SEI 7.

**Statement of Problem and Substantiation for Public Input**

An industry accepted definition of Steel Storage Racks has been recommended for adoption in Chapter 3; as a result, the language in Section 44.6 has been modified.

**Related Public Inputs for This Document**

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
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<tr>
<td>Public Input No. 207-NFPA 5000-2015 [New Section after 3.3]</td>
<td>Definition of steel storage racks.</td>
</tr>
</tbody>
</table>

**Submitter Information Verification**

**Submitter Full Name:** BONNIE MANLEY  
**Organization:** AMERICAN IRON AND STEEL INSTIT  
**Affiliation:** RMI  
**Street Address:**  
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**Submittal Date:** Mon Jul 06 14:13:58 EDT 2015

**Committee Statement**

**Resolution:** FR-7519-NFPA 5000-2015  
**Statement:** An industry accepted definition of Steel Storage Racks has been recommended for adoption in Chapter 3; as a result, the language in Section 44.6 has been modified.
44.7.2—Cold-Formed Steel Decks.

44.7.2.1 The design and construction of cold-formed steel decks shall be in accordance with this section.

44.7.2.2 Composite slabs of concrete on cold-formed steel decks shall be designed and constructed in accordance with ASCE/SEI 3, ANSI/SDI-C1.0 C, Standard for Composite Steel Floor Deck Slabs, or other approved standards.

44.7.2.3 Steel Roof Deck.

Steel

2 Cold-formed steel roof decks shall be designed and constructed in accordance with ANSI/SDI-RD, Standard for Steel Roof Deck.

44.7.2.4 Non-Composite Steel Floor Deck.

Non-composite cold-formed steel floor decks shall be designed and constructed in accordance with ANSI/SDI-NC, Standard for Non-Composite Steel Floor Deck.

Statement of Problem and Substantiation for Public Input

Along with a few editorial modifications, the reference to ASCE 3 is recommended for deletion. The standard has been withdrawn by ASCE. Additionally, there are no other approved standards, and, as a consequence, it should be deleted.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
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<tr>
<td>Public Input No. 201-NFPA 5000-2015 [Section No. 2.3.31]</td>
<td>Updates to SDI standards</td>
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</tbody>
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Submittal Date: Mon Jul 06 13:57:04 EDT 2015

Committee Statement

Resolution: FR-7520-NFPA 5000-2015
Statement: Along with a few editorial modifications, the reference to ASCE 3 is recommended for deletion. The standard has been withdrawn by ASCE. Additionally, there are no other approved standards, and, as a consequence, it should be deleted.
44.7.2.2
Composite slabs of concrete on steel decks shall be designed and constructed in accordance with ASCE/SEI 3, ANSI/SDI-C1.0—C Standard for Composite Steel Floor Deck—Slabs, or other approved standards.

Statement of Problem and Substantiation for Public Input

This is an editorial correction. The document is correctly known as "C", not "C1.0".

Submitter Information Verification

Submitter Full Name: Thomas Sputo
Organization: Steel Deck Institute
Street Address:
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Submittal Date: Wed Mar 11 19:47:01 EDT 2015

Committee Statement

Resolution: FR-7520-NFPA 5000-2015
Statement: Along with a few editorial modifications, the reference to ASCE 3 is recommended for deletion. The standard has been withdrawn by ASCE. Additionally, there are no other approved standards, and, as a consequence, it should be deleted.
44.7.2.2
Composite slabs of concrete on steel decks shall be designed and constructed in accordance with ASCE/SEI 3, ANSI/SDI-C1.0, Standard for Composite Steel Floor Deck – Slabs, or other approved standards.

Statement of Problem and Substantiation for Public Input

The ASCE/SEI 3 standard has been withdrawn by ASCE and is no longer available. It has been supplanted by the SDI C Standard. There is no need to refer to "other approved standards" in this section because Section 1.5 would cover alternate standards and methods.

Submitter Information Verification

Submitter Full Name: Thomas Sputo  
Organization: Steel Deck Institute

Committee Statement

Resolution: FR-7520-NFPA 5000-2015
Statement: Along with a few editorial modifications, the reference to ASCE 3 is recommended for deletion. The standard has been withdrawn by ASCE. Additionally, there are no other approved standards, and, as a consequence, it should be deleted.
44.7.3 Seismic Requirements for Cold-Formed Steel Structures.

Where a response modification coefficient, \( R \), in accordance with ASCE/SEI 7, Table 12.2-1, is used for the design of cold-formed steel structures, the structures shall be designed and detailed in accordance with the requirements of AISI S100, ASCE/SEI 8, and, for cold-formed steel special bolted moment frames, AISI S110 S400.

Statement of Problem and Substantiation for Public Input

In 2015, AISI S400, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, was developed. This Standard is intended to address the design and construction of cold-formed steel structural members and connections used in the seismic force-resisting systems in buildings and other structures.

In this first edition, the material represents a merging of AISI S110, Standard for Seismic Design of Cold-Formed Steel Structural Systems – Special Bolted Moment Frame, 2007 with Supplement No. 1-09, and the seismic portions of AISI S213, North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 with Supplement No. 1-09. In addition, many of the seismic design requirements stipulated in this Standard are drawn from ANSI/AISC 341-10, Seismic Provisions for Structural Steel Buildings, developed by the American Institute of Steel Construction (AISC).

AISI S400 is intended to supersede AISI S110 and the seismic design provisions of AISI S213. While the standard is new, minimal technical changes have been made to the design and detailing requirements for the cold-formed steel special bolted moment frame. Public review on the new standard finishes on July 6, 2015, with publication expected by the end of 2015.

Related Public Inputs for This Document

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<tr>
<th>Related Input</th>
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<tbody>
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<td>Public Input No. 180-NFPA 5000-2015</td>
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<tr>
<td>[Section No. 2.3.4]</td>
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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
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Submittal Date: Mon Jul 06 10:45:18 EDT 2015

Committee Statement

Resolution: FR-7521-NFPA 5000-2015
Statement: In 2015, AISI S400, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, was developed. This Standard is intended to address the design and construction of cold-formed steel structural members and connections used in the seismic force-resisting systems in buildings and other structures.

In this first edition, the material represents a merging of AISI S110, Standard for Seismic Design of Cold-Formed Steel Structural Systems – Special Bolted Moment Frame, 2007 with Supplement No. 1-09, and the seismic portions of AISI S213, North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 with Supplement No. 1-09. In addition, many of the seismic design requirements stipulated in this Standard are drawn from ANSI/AISC 341-10, Seismic Provisions for Structural Steel Buildings, developed by the American Institute of Steel Construction (AISC).

AISI S400 is intended to supersede AISI S110 and the seismic design provisions of AISI S213. While the standard is new, minimal technical changes have been made to the design and detailing requirements for the cold-formed steel special bolted moment frame. Public review on the new standard finishes on July 6, 2015, with publication expected by the end of 2015.
44.8 Cold-Formed Steel Light Frame Construction.

44.8.1 General Structural Members.
The design and installation of structural members and non-structural members connections utilized in cold-formed steel light frame construction, where the specified minimum base steel thickness is not greater than 0.1180 in. (2.997 mm), applications shall be in accordance with AISI S200 S240, North American Standard for Cold-Formed Steel Structural Framing — General Provisions, and 44.8.2 through 44.8.6, or AISI S220, 1.2, as applicable.

44.8.2 Structural Wall Stud Design.
Structural wall studs shall be designed in accordance with AISI S211, North American Standard 1.1 Seismic Requirements for Cold-Formed Steel Framing — 3/4 Wall Stud Design, or Structural Systems. Where a response modification coefficient, R, in accordance with AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members.

44.8.3 Truss Design.
Trusses shall be designed in accordance with AISI S214, North American Standard for Cold-Formed Steel Framing — Truss Design.

44.8.4 Header Design.
Headers, including box and back-to-back headers, and double and single L-headers, shall be designed in accordance with AISI S212, North American Standard for Cold-Formed Steel Framing — Header Design, or in accordance with AISI S100.

44.8.5 Lateral Design.
Light-framed shear walls, diagonal strap bracing (that is part of a structural wall) and diaphragms to resist wind, seismic and other in-plane lateral loads shall be designed in accordance with AISI S213, North American Standard for Cold-Formed Steel Framing — Lateral Design.

44.8.6 Floor and Roof System Design.
Framing for floor and roof systems in buildings shall be designed in accordance with AISI S210, North American Standard for Cold-Formed Steel Framing — Floor and Roof System Design, or in accordance with AISI S100.

44.8.7 Prescriptive Framing.
ASCE/SEI 7, Table 12.2-1, is used for the design of cold-formed steel light frame construction, the cold-formed steel structural members and connections in the seismic force-resisting systems and diaphragms of buildings and other structures shall be designed and constructed in accordance with the requirements of AISI S400, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems.

44.8.1.2 Prescriptive Framing. Detached one- and two-family dwellings and townhouses, less than or equal to three stories in height, shall be permitted to be constructed in accordance with AISI S230, Standard for Cold-Formed Steel Framing — Prescriptive Method for One- and Two-Family Dwellings, subject to the limitations therein.
Nonstructural Members.  The design and installation of nonstructural members and connections utilized in cold-formed steel light frame construction applications shall be in accordance with AISI S220, North American Standard for Cold-Formed Steel Framing — Nonstructural Members.

Statement of Problem and Substantiation for Public Input

This proposal splits apart the cold-formed steel light frame construction structural provisions [now Section 44.8.1] and nonstructural provisions [now Section 44.8.2] and adds references to two new structural standards — AISI S240 and AISI S400.

Section 44.8.1 now adopts AISI S240, North American Standard for Cold-Formed Steel Structural Framing, which addresses requirements for construction with cold-formed steel structural framing that are common to prescriptive and engineered design. This standard is intended for adoption and use in the United States, Canada and Mexico and integrates the following AISI standards into one document:

* AISI S200-12, North American Standard for Cold-Formed Steel Framing-General Provisions
* AISI S210-07 (2012), North American Standard for Cold-Formed Steel Framing–Floor and Roof System Design (Reaffirmed 2012)
* AISI S211-07(2012), North American Standard for Cold-Formed Steel Framing–Wall Stud Design (Reaffirmed 2012)
* AISI S212-07(2012), North American Standard for Cold-Formed Steel Framing–Header Design (Reaffirmed 2012)
* AISI S213-07w/S1-09(2012), North American Standard for Cold-Formed Steel Framing– Lateral Design with Supplement 1 (Reaffirmed 2012)
* AISI S214-12, North American Standard for Cold-Formed Steel Framing–Truss Design

Consequently, AISI S240 supersedes all previous editions of the above mentioned individual AISI standards.

The new section 44.8.1.1 adopts AISI S400, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, which was developed in 2015. This Standard addresses the design and construction of cold-formed steel structural members and connections used in the seismic force-resisting systems in buildings and other structures. In this first edition, the material represents a merging of AISI S110, Standard for Seismic Design of Cold-Formed Steel Structural Systems – Special Bolted Moment Frame, 2007 with Supplement No. 1-09, and the seismic portions of AISI S213, North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 with Supplement No. 1-09. In addition, many of the seismic design requirements stipulated in this Standard are drawn from ANSI/AISC 341-10, Seismic Provisions for Structural Steel Buildings, developed by the American Institute of Steel Construction (AISC). The application of this Standard should be in conjunction with AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members, and AISI S240, North American Standard for Cold-Formed Steel Framing.

AISI S400 supersedes AISI S110 and the seismic design provisions of AISI S213. While the standard is new, minimal technical changes have been made to the design and detailing requirements for the cold-formed steel light frame seismic force-resisting systems specified therein.

Section 44.8.1.2 adopts the revised edition of AISI S230. With this revision, AISI S230 is now in full compliance with the 2015 edition of the International Residential Code, ASCE 7-10 including applicable supplements, and the latest referenced documents. Provisions were added for larger openings in floors, ceilings and roofs. Additionally, the tables were streamlined to reduce complexity and volume of the provisions.

Finally, the new Section 44.8.2 adopts the revised edition of AISI S220. This new edition adds performance and testing requirements for screw penetration, update referenced documents, and reference the new AISI S915, Test Standard for Through-the-Web Punchout Cold-Formed Steel Wall...
Stud Bridging Connectors, and AISI S916, Test Standard for Cold-Formed Steel Framing - Nonstructural Interior Partitions with Gypsum Board.

Public review on AISI S230, AISI S240 and AISI S400 finishes on July 6, 2015, while the public review on AISI S220 finishes on July 13, 2015. All documents are expected to be published by the end of 2015.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
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<td>Public Input No. 180-NFPA 5000-2015 [Section No. 2.3.4]</td>
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<td>Public Input No. 181-NFPA 5000-2015 [Section No. 40.3.10]</td>
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Submitter Information Verification

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Submittal Date: Mon Jul 06 11:18:32 EDT 2015

Committee Statement

Resolution: FR-7522-NFPA 5000-2015
Statement: This proposal splits apart the cold-formed steel light frame construction structural provisions [now Section 44.8.1] and nonstructural provisions [now Section 44.8.2] and adds references to two new structural standards -- AISI S240 and AISI S400.

Section 44.8.1 now adopts AISI S240, North American Standard for Cold-Formed Steel Structural Framing, which addresses requirements for construction with cold-formed steel structural framing that are common to prescriptive and engineered design. This standard is intended for adoption and use in the United States, Canada and Mexico and integrates the following AISI standards into one document:

* AISI S200-12, North American Standard for Cold-Formed Steel Framing-General Provisions

* AISI S210-07 (2012), North American Standard for Cold-Formed Steel Framing–Floor and Roof System Design (Reaffirmed 2012)

* AISI S211-07(2012), North American Standard for Cold-Formed Steel Framing–Wall Stud Design (Reaffirmed 2012)

* AISI S212-07(2012), North American Standard for Cold-Formed Steel Framing–Header Design (Reaffirmed 2012)

* AISI S213-07w/S1-09(2012), North American Standard for Cold-Formed Steel Framing– Lateral Design with Supplement 1 (Reaffirmed 2012)
Consequently, AISI S240 supersedes all previous editions of the above mentioned individual AISI standards.

The new section 44.8.1.1 adopts AISI S400, North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, which was developed in 2015. This Standard addresses the design and construction of cold-formed steel structural members and connections used in the seismic force-resisting systems in buildings and other structures. In this first edition, the material represents a merging of AISI S110, Standard for Seismic Design of Cold-Formed Steel Structural Systems – Special Bolted Moment Frame, 2007 with Supplement No. 1-09, and the seismic portions of AISI S213, North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 with Supplement No. 1-09. In addition, many of the seismic design requirements stipulated in this Standard are drawn from ANSI/AISC 341-10, Seismic Provisions for Structural Steel Buildings, developed by the American Institute of Steel Construction (AISC). The application of this Standard should be in conjunction with AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members, and AISI S240, North American Standard for Cold-Formed Steel Framing.

AISI S400 supersedes AISI S110 and the seismic design provisions of AISI S213. While the standard is new, minimal technical changes have been made to the design and detailing requirements for the cold-formed steel light frame seismic force-resisting systems specified therein.

Section 44.8.1.2 adopts the revised edition of AISI S230. With this revision, AISI S230 is now in full compliance with the 2015 edition of the International Residential Code, ASCE 7-10 including applicable supplements, and the latest referenced documents. Provisions were added for larger openings in floors, ceilings and roofs. Additionally, the tables were streamlined to reduce complexity and volume of the provisions.

Finally, the new Section 44.8.2 adopts the revised edition of AISI S220. This new edition adds performance and testing requirements for screw penetration, update referenced documents, and reference the new AISI S915, Test Standard for Through-the-Web Punchout Cold-Formed Steel Wall Stud Bridging Connectors, and AISI S916, Test Standard for Cold-Formed Steel Framing - Nonstructural Interior Partitions with Gypsum Board.

Public review on AISI S230, AISI S240 and AISI S400 finishes on July 6, 2015, while the public review on AISI S220 finishes on July 13, 2015. All documents are expected to be published by the end of 2015.
45.2.8.1 Fire Retardant-Treated Wood.

A wood product impregnated with chemical by a pressure process or impregnated with chemical by other means during manufacture, treated to exhibit reduced surface-burning characteristics and resist propagation of fire. [703:3.3.2].

Statement of Problem and Substantiation for Public Input

Discussion during past code development cycles have shown there is confusion as to what process the phrase "other means during manufacture" is referring. Testimony often leaves out the "during manufacture" part of the phrase leading one to assume coating applied after manufacture is permitted. Attempts to clarify have only been partially successful.

Dictionary Definition: impregnate
im-preg-nate (im-pregnat)v.tr. im-preg-nat-ed, im-preg-nat-ing, im-preg-nates. 1. To make pregnant; inseminate. 2. To fertilize (an ovum, for example). 3. To fill throughout; saturate: a cotton wad that was impregnated with ether. 4. To permeate or imbue: impregnate a speech with optimism. Excerpted from American Heritage Talking Dictionary. Copyright © 1997 The Learning Company, Inc. All Rights Reserved.

Impregnate describes the process mandated by the code with the phrase "other means during manufacture." The current Section 45.5.16.2.2 states the treatment is an integral part of the manufacturing process. A presentation by Benjamin Floyd and Alan Ross, Kop-Cote, Inc., at the 2010 Forest Products Society conference in Orlando, FL explains what integral means for wood treatments. It is "The term "integral treatments" refers to combining the active ingredients with the wood furnish (i.e., chips, flakes, strands, etc.) before processing." The dictionary definition of "impregnate" #3 shown above eliminates any confusion as to what the code expects for FRTW.

A review of the available literature shows all the testing done for acceptance of FRTW into the codes was performed on wood impregnated with chemicals. The testing ranged from small scale (ASTM E160), to large scale (ASTM E84 and E119) to full scale (White House, (UL 1256 part 2).

The revision clarifies what is expected and eliminates possible confusion pertaining to the "other means during manufacture" statement.

Submitter Information Verification

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Submittal Date: Tue Jun 02 18:06:28 EDT 2015
Committee Statement

Resolution: No change made in NFPA 703.
Public Input No. 38-NFPA 5000-2015 [Section No. 45.5.16.1 [Excluding any Sub-Sections]]

Fire retardant–treated wood shall be a wood product impregnated with chemical by a pressure process or impregnated with chemical by other means during manufacture meeting the requirements in 45.5.16.1.2 through 45.5.16.1.5. [703:4.1.1]

Statement of Problem and Substantiation for Public Input

Discussion during past code development cycles have shown there is confusion as to what process the phrase "other means during manufacture" is referring. Testimony often leaves out the "during manufacture" part of the phrase leading one to assume coating applied after manufacture is permitted. Attempts to clarify have only been partially successful.

Dictionary Definition: impregnate
im-preg-nate (im-pregnat)v.tr. im-preg-nat-ed, im-preg-nat-ing, im-preg-nates. 1. To make pregnant; inseminate. 2. To fertilize (an ovum, for example). 3. To fill throughout; saturate: a cotton wad that was impregnated with ether. 4. To permeate or imbue: impregnate a speech with optimism. Excerpted from American Heritage Talking Dictionary. Copyright © 1997 The Learning Company, Inc. All Rights Reserved.

Impregnate describes the process mandated by the code with the phrase "other means during manufacture." The current Section 45.5.16.2.2 states the treatment is an integral part of the manufacturing process. A presentation by Benjamin Floyd and Alan Ross, Kop-Cote, Inc., at the 2010 Forest Products Society conference in Orlando, FL explains what integral means for wood treatments. It is "The term "integral treatments" refers to combining the active ingredients with the wood furnish (i.e., chips, flakes, strands, etc.) before processing." The dictionary definition of "impregnate" #3 shown above eliminates any confusion as to what the code expects for FRTW.

A review of the available literature shows all the testing done for acceptance of FRTW into the codes was performed on wood impregnated with chemicals. The testing ranged from small scale (ASTM E160), to large scale (ASTM E84 and E119) to full scale (White House, (UL 1256 part 2).

The revision clarifies what is expected and eliminates possible confusion pertaining to the "other means during manufacture" statement.

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Submittal Date: Tue Jun 02 17:35:00 EDT 2015
Committee Statement

Resolution: No change made in NFPA 703.
Public Input No. 78-NFPA 5000-2015 [ New Section after 45.5.16.1.4 ]

45.5.16.1.5* Wood products that have been impregnated with chemical by a pressure process or other means during manufacture shall be permitted to be tested in accordance with ASTM E2768, Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 min Tunnel Test) and to comply with its requirements.

A.45.5.16.1.5 ASTM E2768 was developed specifically as an alternate (and equivalent) description of the "extended" 30 minute ASTM E84 fire test. It utilizes the same apparatus (known as the Steiner tunnel) and the test is conducted for 30 minutes (meaning that it is conducted for an additional 20 minute period as compared with standard ASTM E84 tests of 10 minute duration) and it assesses how far the flame front progresses beyond the centerline of the burners throughout the test. Laboratories have traditionally assessed "significant progressive combustion" simply as the extent of the flame front progress and have not conducted other tests to determine that a wood material is fire retardant treated wood.

(renumber 45.5.16.1.5 and 45.5.16.1.6 as 45.5.16.1.6 and 45.5.16.1.7)

Statement of Problem and Substantiation for Public Input

ASTM E2768 was developed specifically for this purpose. It does exactly what ASTM E84 extended does and assesses the same properties.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
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Submittal Date: Wed Jul 01 18:51:31 EDT 2015

Committee Statement

Resolution: No change made in NFPA 703.
45.5.16.1.5
For wood products manufactured using impregnated with chemical using a means other than a pressure process, all sides of the wood product shall be tested in accordance with and produce the results required in 45.5.16.1.1 through 45.5.16.1.4.

Statement of Problem and Substantiation for Public Input

Discussion during past code development cycles have shown there is confusion as to what process the phrase "other means during manufacture" is referring. Testimony often leaves out the "during manufacture" part of the phrase leading one to assume coating applied after manufacture is permitted. Attempts to clarify have only been partially successful.

Dictionary Definition: impregnate
im-preg-nate (im-pregnat)v.tr. im-preg-nat-ed, im-preg-nat-ing, im-preg-nates. 1. To make pregnant; inseminate. 2. To fertilize (an ovum, for example). 3. To fill throughout; saturate: a cotton wad that was impregnated with ether. 4. To permeate or imbue: impregnate a speech with optimism. Excerpted from American Heritage Talking Dictionary. Copyright © 1997 The Learning Company, Inc. All Rights Reserved.

Impregnate describes the process mandated by the code with the phrase "other means during manufacture." The current Section 45.5.16.2.2 states the treatment is an integral part of the manufacturing process. A presentation by Benjamin Floyd and Alan Ross, Kop-Cote, Inc., at the 2010 Forest Products Society conference in Orlando, FL explains what integral means for wood treatments. It is "The term "integral treatments" refers to combining the active ingredients with the wood furnish (i.e., chips, flakes, strands, etc.) before processing." The dictionary definition of "impregnate" #3 shown above eliminates any confusion as to what the code expects for FRTW.

A review of the available literature shows all the testing done for acceptance of FRTW into the codes was performed on wood impregnated with chemicals. The testing ranged from small scale (ASTM E160), to large scale (ASTM E84 and E119) to full scale (White House, (UL 1256 part 2).

The revision clarifies what is expected and eliminates possible confusion pertaining to the "other means during manufacture" statement.

Submitter Information Verification

Submitter Full Name: JOSEPH HOLLAND
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Street Address:
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Submittal Date: Tue Jun 02 17:52:51 EDT 2015
Committee Statement

Resolution: FR-7523-NFPA 5000-2015
Statement: The equivalent section from NFPA 703 was deleted.
### Public Input No. 77-NFPA 5000-2015 [ Section No. 45.5.16.1.5 ]

<table>
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<tbody>
<tr>
<td>For wood products manufactured using a means other than a pressure process that have not been impregnated with chemical or that have been coated, all sides of the wood product shall be tested in accordance with and produce the results required in 45.5.16.1.1 through 45.5.16.1.4.</td>
</tr>
</tbody>
</table>

#### Statement of Problem and Substantiation for Public Input

This section provides a restraint of trade because it incorporates different requirements based not on what the product is but simply based on the means by which the product was manufactured. That is incorrect. Requirements must be based on the properties of the product itself. Section 45.5.16.1 is clear that fire retardant-treated wood requires that the product be impregnated with chemical but it can be made by a pressure process or by any other means. The key issue is that the product should be "impregnated" and should not be coated.

Section 45.5.16.2 is explicit again in that the issue is the impregnation of chemical throughout the product, with any method of manufacture.

The public input fixes this problem.

45.5.16.1 Fire Retardant–Treated Wood. Fire retardant–treated wood shall be a wood product impregnated with chemical by a pressure process or other means during manufacture meeting the requirements in 45.5.16.1.2 through 45.5.16.1.5.

#### Submitter Information Verification

- **Submitter Full Name:** MARCELO HIRSCHLER
- **Organization:** GBH INTERNATIONAL
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Wed Jul 01 18:43:30 EDT 2015

#### Committee Statement

- **Resolution:** FR-7523-NFPA 5000-2015
- **Statement:** The equivalent section from NFPA 703 was deleted.
For wood products produced impregnated with chemical by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.

Statement of Problem and Substantiation for Public Input

Discussion during past code development cycles have shown there is confusion as to what process the phrase "other means during manufacture" is referring. Testimony often leaves out the "during manufacture" part of the phrase leading one to assume coating applied after manufacture is permitted. Attempts to clarify have only been partially successful.

Dictionary Definition: impregnate
im-preg-nate (im-pregnat)v.tr. im-preg-nat-ed, im-preg-nat-ing, im-preg-nates. 1. To make pregnant; inseminate. 2. To fertilize (an ovum, for example). 3. To fill throughout; saturate: a cotton wad that was impregnated with ether. 4. To permeate or imbue: impregnate a speech with optimism. Excerpted from American Heritage Talking Dictionary. Copyright © 1997 The Learning Company, Inc. All Rights Reserved.

Impregnate describes the process mandated by the code with the phrase "other means during manufacture." The current Section 45.5.16.2.2 states the treatment is an integral part of the manufacturing process. A presentation by Benjamin Floyd and Alan Ross, Kop-Cote, Inc., at the 2010 Forest Products Society conference in Orlando, FL explains what integral means for wood treatments. It is "The term "integral treatments" refers to combining the active ingredients with the wood furnish (i.e., chips, flakes, strands, etc.) before processing." The dictionary definition of "impregnate" #3 shown above eliminates any confusion as to what the code expects for FRTW.

A review of the available literature shows all the testing done for acceptance of FRTW into the codes was performed on wood impregnated with chemicals. The testing ranged from small scale (ASTM E160), to large scale (ASTM E84 and E119) to full scale (White House, (UL 1256 part 2).

The revision clarifies what is expected and eliminates possible confusion pertaining to the "other means during manufacture" statement.

Submitter Information Verification

Submitter Full Name: JOSEPH HOLLAND
Organization: HOOVER TREATED WOOD PRODUCTS
Affiliation: Hoover Treated Wood Products
Street Address:
City:
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Zip:
Submittal Date: Tue Jun 02 17:38:01 EDT 2015
Committee Statement

Resolution: FR-7524-NFPA 5000-2015

Statement: A change to the paragraph in NFPA 703 that serves as the extract basis for this section in NFPA 5000 was revised. [See NFPA 703 PI 7/FR5]. The committee statement for that change is as follows.

Discussion during past code development cycles have shown there is confusion as to what process the phrase "other means during manufacture" is referring. This discussion often leaves out the "during manufacture" part of the phrase leading one to assume coating applied after manufacture is permitted. Attempts to clarify have only been partially successful.

Dictionary Definition: impregnate

im-preg-nate (im-pregnat)v.tr. im-preg-nat-ed, im-preg-nat-ing, im-preg-nates. 1. To make pregnant; inseminate. 2. To fertilize (an ovum, for example). 3. To fill throughout; saturate: a cotton wad that was impregnated with ether. 4. To permeate or imbue: impregnate a speech with optimism. Excerpted from American Heritage Talking Dictionary. Copyright © 1997 The Learning Company, Inc. All Rights Reserved.

Impregnate describes the process mandated by the code with the phrase "other means during manufacture." The current Section 45.5.16.2.2 in NFPA 5000 states the treatment is an integral part of the manufacturing process. A presentation by Benjamin Floyd and Alan Ross, Kop-Cote, Inc., at the 2010 Forest Products Society conference in Orlando, FL explains what integral means for wood treatments. It is "The term "integral treatments" refers to combining the active ingredients with the wood furnish (i.e., chips, flakes, strands, etc.) before processing." The dictionary definition of "impregnate" #3 shown above eliminates any confusion as to what the code expects for FRTW.

A review of the available literature shows all the testing done for acceptance of FRTW into the codes was performed on wood impregnated with chemicals. The testing ranged from small scale (ASTM E160), to large scale (ASTM E84 and E119) to full scale (White House, (UL 1256 part 2).

The revision clarifies what is expected and eliminates possible confusion pertaining to the "other means during manufacture" statement.
Sections 45.5.16.2.2.1, 45.5.16.2.2.2

45.5.16.2.2.1 Wood Structural Panels.
Adjustment to design values for wood structural panels shall be in accordance with the following:

(1) The effect of the treatment, the method of redrying after treatment, and the exposure to high temperatures and high humidities on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D 5516, Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant-Treated Softwood Plywood Exposed to Elevated Temperatures.

(2) The test data developed by ASTM D 5516 shall be used to develop adjustment factors or maximum loads and spans, or both, for untreated plywood design values in accordance with ASTM D 6305, Standard Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated Plywood Roof Sheathing.

(3) Each manufacturer shall publish the allowable maximum loads and spans for service as floor and roof sheathing for their treatment.

45.5.16.2.2.2 Lumber.
Adjustment to design values for lumber shall be in accordance with the following:

(1) For each species of wood treated, the effect of the treatment, the method of redrying after treatment, and the exposure to high temperatures and high humidities on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D 5664, Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant-Treated Lumber.

(2) The test data developed by ASTM D 5664 shall be used to develop modification factors for use at or near room temperature and at elevated temperatures and humidity in accordance with ASTM D 6841, Standard Practice for Calculating Design Value Treatment Adjustment Factors for Fire-Retardent-Treated Lumber.

(3) Each manufacturer shall publish the modification factors for service at ambient temperatures of up to 100°F (37.8°C) and for service as roof framing.

(4) The roof framing modification factors shall take into consideration the climatological location.

Renumber remaining sections

Statement of Problem and Substantiation for Public Input
Renumber: these sections are not a subsection of "other means during manufacture" but a requirement for all FRTW to be tested using the ASTM Standard for Wood Structural Panels or Lumber

Submitter Information Verification
Submitter Full Name: JOSEPH HOLLAND
<table>
<thead>
<tr>
<th>Organization:</th>
<th>HOOVER TREATED WOOD PRODUCTS</th>
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</thead>
<tbody>
<tr>
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<td>Hoover Treated Wood Products</td>
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**Committee Statement**

**Resolution:** FR-7525-NFPA 5000-2015  
**Statement:** The revision renumbers the subsections. These sections are not a subsection of "other means during manufacture" but a requirement for all FRTW to be tested using the ASTM Standard for Wood Structural Panels or Lumber.
Public Input No. 2-NFPA 5000-2015 [ Section No. 45.6.8.8 ]

45.6.8.8

Fasteners and connectors for fire-retardant-treated wood exposed to weather or damp or wet locations shall be of hot-dipped, zinc-coated galvanized steel; stainless steel; silicon; bronze; or copper.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

NOTE: The following Public Input appeared as “Reject but Hold” in Public Comment No. 31 of the A2014 Second Draft Report for NFPA 5000 and per the Regs. at 4.4.8.3.1.

The section is currently silent as to what materials a connector must be. This change will let the user know what material the connector needs to be.

Submitter Information Verification

Submitter Full Name: TC ON BLD-SCM
Organization: NFPA TC on Structures, Construction and Materials
Street Address: City:
State:
Zip: Submittal Date: Thu Feb 12 11:52:17 EST 2015

Committee Statement

Resolution: FR-7526-NFPA 5000-2015
Statement: NOTE: The following Public Input appeared as “Reject but Hold” in Public Comment No. 31 of the A2014 Second Draft Report for NFPA 5000 and per the Regs. at 4.4.8.3.1.

The section is currently silent as to what materials a connector must be. This change will let the user know what material the connector needs to be.
Components used to join wood members together are either fasteners or connectors. The added language will provide consistency with similar provisions for FRTW as well as other types of wood.
45.6.8.8

**Fasteners** for and connectors for fire-retardant-treated wood exposed to weather or damp or wet locations shall be of hot-dipped, zinc-coated galvanized steel; stainless steel; silicon; bronze; or copper.

### Additional Proposed Changes

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### Statement of Problem and Substantiation for Public Comment

The section is currently silent as to what materials a connector must be. This change will let the user know what material the connector needs to be.

### Submitter Information Verification

**Submitter Full Name:** Joseph Holland  
**Organization:** Hoover Treated Wood Products  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Apr 16 17:28:11 EDT 2013

### Committee Statement

**Committee Action:** Rejected but held  
**Resolution:** This change is considered new material since it is not related to a First Revision. The committee is holding this item so it can be reviewed during the next first draft meeting.

---

**Copyright Assignment**

I, Joseph Holland, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

By checking this box I affirm that I am Joseph Holland, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature.
Public Input No. 72-NFPA 5000-2015 [ Section No. 45.6.8.9 ]

45.6.8.9
Fasteners and connectors for fire-retardant-treated wood used in interior locations shall be in accordance with the manufacturer's recommendations. In the absence of manufacturer's recommendations, 45.6.8.8 shall apply.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

NOTE: The following Public Input appeared as "Reject but Hold" in Public Comment No. 32 of the A2014 Second Draft Report for NFPA 5000 and per the Regs. at 4.4.8.3.1.

The section is currently silent as to what materials a connector must be. This change will let the user know what material the connector needs to be.

Submitter Information Verification

Submitter Full Name: TC ON BLD-SCM
Organization: NFPA TC ON STRUCTURES, CONSTRUCTION AND MATERIALS
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City: 
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Submittal Date: Wed Jul 01 09:17:45 EDT 2015

Committee Statement

Resolution: FR-7528-NFPA 5000-2015
Statement: NOTE: The following Public Input appeared as "Reject but Hold" in Public Comment No. 32 of the A2014 Second Draft Report for NFPA 5000 and per the Regs. at 4.4.8.3.1.

The section is currently silent as to what materials a connector must be. This change will let the user know what material the connector needs to be.
Components used to join wood members together are either fasteners or connectors. The added language will provide consistency with similar provisions for FRTW as well as other types of wood.
Public Comment No. 32-NFPA 5000-2013 [Section No. 45.6.8.9]

45.6.8.9

Fasteners for and connectors for fire-retardant-treated wood used in interior locations shall be in accordance with the manufacturer's recommendations. In the absence of manufacturer's recommendations, 45.6.8.8 shall apply.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Comment

The section is currently silent as to what materials a connector must be. This change will let the user know what material the connector needs to be.

Submitter Information Verification

Submitter Full Name: Joseph Holland
Organization: Hoover Treated Wood Products
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 16 17:36:18 EDT 2013

Committee Statement

Committee Action: Rejected but held
Resolution: This change is considered new material since it is not related to a First Revision. The committee is holding this item so it can be reviewed during the next first draft meeting,
Public Input No. 189-NFPA 5000-2015 [Section No. 47.2.1.4.4]

47.2.1.4.4 Cold-Formed Steel Light-Frame Construction Support.

47.2.1.4.4.1 Nonstructural cold-formed steel studs and track shall comply with AISI S220, *North American Standard for Cold-Formed Steel Framing–Nonstructural Members*, and ASTM C 645, *Standard Specification for Nonstructural Steel Framing Members*, Section 10.

47.2.1.4.4.2 Structural cold-formed steel studs and track shall comply with AISI S240, *North American Standard for Cold-Formed Steel Framing–General Provisions*, and ASTM C 955, *Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases*, Section 8 *Structural Framing*.

Statement of Problem and Substantiation for Public Input

In Section 47.2.1.4.4.1, the screw penetration test has been added to the new edition of AISI S220 from ASTM C645, so the reference is no longer needed.

In Section 47.2.1.4.4.2, the new AISI S240 is adopted and the reference to the screw penetration test in ASTM C955 is deleted. Upon review, the AISI Committee on Framing Standards decided that the test procedure was not really applicable to structural members.

Public review on AISI S240 finishes on July 6, 2015, while the public review on AISI S220 finishes on July 13, 2015. Both documents are expected to be published by the end of 2015.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 12:06:27 EDT 2015

Committee Statement
**Resolution:** FR-7529-NFPA 5000-2015  
**Statement:** In Section 47.2.1.4.4.1, the screw penetration test has been added to the new edition of AISI S220 from ASTM C645, so the reference is no longer needed.

In Section 47.2.1.4.4.2, the new AISI S240 is adopted and the reference to the screw penetration test in ASTM C955 is deleted. Upon review, the AISI Committee on Framing Standards decided that the test procedure was not really applicable to structural members.

Public review on AISI S240 finishes on July 6, 2015, while the public review on AISI S220 finishes on July 13, 2015. Both documents are expected to be published by the end of 2015.
Proposed new definitions:

**PLASTIC COMPOSITE.** A generic designation that refers to wood/plastic composites and plastic lumber.

**PLASTIC LUMBER.** A manufactured product made primarily of plastic materials (filled or unfilled) which is generally rectangular in cross section.

**WOOD/PLASTIC COMPOSITE.** A composite material made primarily from wood or cellulose-based materials and plastic.

Statement of Problem and Substantiation for Public Input

Proposing definitions related to proposal to include requirements for plastic composite deck boards, stair treads, handrails, and guards.

Related Public Inputs for This Document

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</table>

Submitter Information Verification

Submitter Full Name: JOHN WOESTMAN  
Organization: KELLEN  
Affiliation: Composite Lumber Manufacturers Association  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Jul 06 16:29:21 EDT 2015

Committee Statement

Resolution: FR-7531-NFPA 5000-2015  
Statement: The definitions for plastic composite deck boards, stair treads, handrails, and guards have been proposed for inclusion in Chapter 48. A First Revision to recognize the composite material was included- See FR # 7530.
48.3.2.3
The requirements of 48.3.2.1 and 48.3.2.2 shall not apply where otherwise permitted by the following:

1. As provided in Section 48.5, the smoke developed index for interior trim shall not be required.

2. Foam plastic insulation in cold storage buildings, ice plants, food plants, food processing rooms, and similar areas that has been tested in a thickness of 4 in. (100 mm) in accordance with ASTM E84 or UL 723, and exhibits a flame spread index not exceeding 75 and a smoke developed index not exceeding 450, shall be permitted in a thickness of up to 10 in. (255 mm) where that portion of the building and the room are equipped with an automatic fire sprinkler system in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

3. The following shall be permitted for foam plastic insulation that is part of a Class A, Class B, or Class C roof covering system: The insulation shall not be required to meet the surface-burning requirements, provided that, when tested in accordance with ASTM E108 or UL 790, and where the system with the foam plastic insulation passes NFPA 276, Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies With Combustible Above-Deck Roofing Components, FM 4450, Approval Standard for Class I Insulated Steel Deck Roofs, or UL 1256, Standard for Fire Test of Roof Deck Constructions, for roof applications, the smoke developed index of foam plastic insulation shall not be required to meet the smoke developed index limits.

4. Foam plastic insulation at the thickness and density intended for use shall not be required where approved and where both of the following criteria are met: The insulation that has been tested in a thickness of 4 in. (100 mm) in accordance with ASTM E84 or UL 723 and exhibits a flame spread index not exceeding 75 and a smoke developed index not exceeding 450, shall be permitted for use in a thickness of up to 10 in. (255 mm) where the end-use configuration is tested in accordance with 48.4.4 or 48.4.1.5. The requirements of 48.3.2.1 and 48.3.2.2 are met when tested at a minimum thickness of 4 in. (100 mm) and at the thickness and density intended for use, and complies with the requirements.

Statement of Problem and Substantiation for Public Input

This section is garbled. The four exceptions should indicate the following:

1. Fine as is.
2. If the room and building are sprinklered the foam plastic insulation can be tested at 4 inches and used at up to 10 inches in thickness. However, it still needs to meet 75/450 at 4 inches.
3. If foam plastic is part of a roof assembly that meets a Class A, B or C in accordance with ASTM E108 or UL 790 and the assembly also meets FM 4456 (with NFPA 276 as a new equivalent) or UL 1256, the foam plastic does not need to meet the smoke requirement. Foam plastic insulation always has to meet the flame spread index requirement.
4. If the foam plastic insulation is approved via large scale tests it can be tested at 4 inches in ASTM E84 (and meet 75/450) and used at up to 10 in. as long as the large scale test was at the thickness and density intended for use.
NFPA 276 needs to be added into Chapter 2.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 15:38:00 EDT 2015

Committee Statement

Resolution: FR-7532-NFPA 5000-2015
Statement: The committee agrees with the need to reorganize and clarify this section. The four conditions now are put into a more logical order and have been clarified as follows:

1. No changes.

2. If the room and building are sprinklered the foam plastic insulation can be tested at 4 inches and used at up to 10 inches in thickness. However, it still needs to meet 75/450 at 4 inches.

3. If foam plastic is part of a roof assembly that meets a Class A, B or C in accordance with ASTM E108 or UL 790 and the assembly also meets FM 4450 (with NFPA 276 as a new equivalent) or UL 1256, the foam plastic does not need to meet the smoke requirement. Foam plastic insulation always has to meet the flame spread index requirement.

4. If the foam plastic insulation is approved via large scale tests it can be tested at 4 inches in ASTM E84 (and meet 75/450) and used at up to 10 in. as long as the large scale test was at the thickness and density intended for use.

NFPA 276 needs to be added into Chapter 2.

New Annex: Recognition of the FM standard as an equivalent option to NFPA 276.
48.3.3.2*

The thermal barrier material shall comply with one of the following:

1. The thermal barrier shall be 1/2 in. (13 mm) gypsum board.

2. The thermal barrier material shall comply with the requirements of the temperature transmission fire test and of the integrity fire test in NFPA 275, *Standard Method of Fire Tests for the Evaluation of Thermal Barriers Used Over Foam Plastic Insulation*.

3. The thermal barrier material shall comply with the temperature transmission test in NFPA 275 and with the conditions of acceptance of FM 4880, UL 1040, or UL 1715 when tested in conjunction with the foam plastic insulation for a period of 15 minutes.

4. The thermal barrier material shall be heavy timber (Type IV (2HH)).

**Statement of Problem and Substantiation for Public Input**

There has been interest expressed in allowing some wood material to be used as a thermal barrier.

Thermal barriers are materials that comply with NFPA 275. In order to comply with NFPA 275 thermal barrier materials (in combination with the foam plastic insulation they are supposed to protect) are supposed to resist flashover after exposure to a room-corner test (using a test specimen that covers 3 walls and the ceiling of an 8 ft. by 12 ft. by 8 ft. room) such as NFPA 286, as well as comply with a number of other requirements (peak heat release rate of no more than 800 kW, flames that don’t reach the extremities of the test specimen, total smoke release of no more than 1,000 m2). As an alternative to testing to NFPA 286 the thermal barriers are allowed to be tested to FM 4880, UL 1040 or UL 1715, all severe large scale tests.

Beyond the reaction-to-fire tests just mentioned, thermal barriers must also be able to pass a fire resistance test using a time-temperature curve like the one in ASTM E119 for 15 minutes.

It is clear (and fire test data have shown this) that thin wood panel materials will not comply with these requirements, because if a thin wood panel, covering a foam plastic insulation material, is exposed to the fire source in NFPA 286, it will reach flashover well before the end of the 15 minute test period. This public input suggests that heavy timber is a wood material that could safely be used as a thermal barrier, while thin wood panels would not be appropriate thermal barriers.

**Submitter Information Verification**

**Submitter Full Name:** MARCELO HIRSCHLER  
**Organization:** GBH INTERNATIONAL  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Jul 06 16:22:28 EDT 2015
Committee Statement

Resolution: FR-7534-NFPA 5000-2015

Statement: Thermal barriers are materials that comply with NFPA 275. In order to comply with NFPA 275 thermal barrier materials (in combination with the foam plastic insulation they are supposed to protect) are supposed to resist flashover after exposure to a room-corner test (using a test specimen that covers 3 walls and the ceiling of an 8 ft. by 12 ft. by 8 ft. room) such as NFPA 286, as well as comply with a number of other requirements (peak heat release rate of no more than 800 kW, flames that don't reach the extremities of the test specimen, total smoke release of no more than 1,000 m2). As an alternative to testing to NFPA 286 the thermal barriers are allowed to be tested to FM 4880, UL 1040 or UL 1715, all severe large scale tests.

Beyond the reaction-to-fire tests just mentioned, thermal barriers must also be able to pass a fire resistance test using a time-temperature curve like the one in ASTM E119 for 15 minutes.

The committee is limiting this new allowance to roof decks only. In addition, there is some confusion as to what thickness is necessary when using this on an exterior wall. The information provided in the PI and summarized above indicates this allowance can only be applied to roof deck assemblies at this point in time.
48.4.4 Alternate Testing and Approval.

48.4.4.1 The requirements of 48.3.3 through 48.4.3 shall be permitted to be replaced by special testing, and the approval of foam plastic shall be based on large-scale tests such as, but not limited to, the following:

1. UL 1715, Standard for Fire Test of Interior Finish Material [including smoke measurements, with total smoke release not to exceed 10,764 ft $^2$ (1000 m $^2$)]
2. UL 1040, Standard for Fire Test of Insulated Wall Construction
3. FM 4880, Approval Standard for Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coating, and Exterior Wall Systems
4. 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 10.4.5.2

48.4.4.2 The testing shall be performed on the finished foam plastic assembly related to the actual end-use configuration and on the maximum thickness intended for use.

48.4.4.3 Cellular or foamed plastic materials tested in accordance with UL 1040, Standard for Fire Test of Insulated Wall Construction, or FM 4880, Approval Standard for Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coating, and Exterior Wall Systems, shall also be tested for smoke release using NFPA 286, with the acceptance criterion of total smoke release not exceeding 10,764 ft $^2$ (1000 m $^2$).

48.4.4.4 Foam plastics used as interior finish shall also conform to the flame spread requirements of Chapter 10.

48.4.4.5 Assemblies, as tested, shall be constructed such that construction details (e.g., joints and seams) are reflective of the final assembly.

Statement of Problem and Substantiation for Public Input

There is an inconsistency between the requirements in this section and those of Chapter 10. In Chapter 10, smoke measurements and criteria are needed for all four tests and not just for NFPA 286. The smoke criterion (which consists of total smoke released not to exceed 1000 m squared) is being added to all tests, as it is in Chapter 10. In the case of UL 1715, the testing can be done at the same time (and using the same equipment) as the other testing because UL 1715 includes smoke measurement as an option. In the case of UL 1040 and FM 4880 that option does not exist, so a test (for smoke only) in accordance with NFPA 286 needs to be performed (as per the requirements of Chapter 10).

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Committee Statement

Resolution: FR-7535-NFPA 5000-2015
Statement: There is an inconsistency between the requirements in this section and those of Chapter 10. In Chapter 10, smoke measurements and criteria are needed for all four tests and not just for NFPA 286. The smoke criterion (which consists of total smoke released not to exceed 1000 m squared) is being added to all tests, as it is in Chapter 10. In the case of UL 1715, the testing can be done at the same time (and using the same equipment) as the other testing because UL 1715 includes smoke measurement as an option. In the case of UL 1040 and FM 4880 that option does not exist, so a test (for smoke only) in accordance with NFPA 286 needs to be performed (as per the requirements of Chapter 10).
### 48.10 Specific Requirements – Plastic Composite Exterior Deck Boards, Stair Treads, Handrails, and Guards

#### 48.10.1 General
Plastic composite exterior deck boards, stair treads, handrails, and guards shall consist of either wood/plastic composites or plastic lumber. Plastic composites shall comply with the provisions of this standard and with the additional requirements of 48.10.

#### 48.10.2 Labeling
Plastic composite deck boards and stair treads, or their packaging, shall bear a label that indicates compliance to ASTM D7032, "Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails)," and includes the allowable load and maximum allowable span determined in accordance with ASTM D7032. Plastic composite handrails and guards, or their packaging, shall bear a label that indicates compliance to ASTM D7032 and includes the maximum allowable span determined in accordance with ASTM D7032.

#### 48.10.3 Flame spread index
Plastic composite deck boards, stair treads, handrails and guards shall exhibit a flame spread index not exceeding 200 when tested in accordance with ASTM E 84 or UL 723. 

*Exception No. 1: Materials determined to be noncombustible.*

#### 48.10.4 Decay and termite resistance
Where required, plastic composite deck boards, stair treads, handrails and guards containing wood, cellulosic or any other biodegradable materials shall be decay and termite resistant as determined in accordance with ASTM D 7032.

#### 48.10.5 Construction requirements
Plastic composites shall be permitted to be used as exterior deck boards, stair treads, handrails and guards where combustible construction is permitted.

#### 48.10.6 Span rating
Plastic composites used as exterior deck boards shall have a span rating determined in accordance with ASTM D 7032.

#### 48.10.7 Instructions
Plastic composite deck boards, stair treads, handrails and guards shall be installed in accordance with this standard and the manufacturer’s instructions.

---

**Statement of Problem and Substantiation for Public Input**

Proposing a new section at the end of the Plastics chapter to include essential requirements for plastic composite exterior deck boards, stair treads, handrails, and guards. The code is essentially silent regarding the use of these materials when manufactured into these components used commonly in the construction of exterior decks.

**Related Public Inputs for This Document**

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 224-NFPA 5000-2015 [New Section after 48.2.7]</td>
<td></td>
</tr>
<tr>
<td>Public Input No. 225-NFPA 5000-2015 [Section No. 2.3.11]</td>
<td></td>
</tr>
</tbody>
</table>

**Submitter Information Verification**

Submitter Full Name: JOHN WOESTMAN
Committee Statement

Resolution: FR-7530-NFPA 5000-2015

Statement: A new section at the end of the plastics chapter has been added to include essential requirements for plastic composite exterior deck boards, stair treads, handrails, and guards. The code is essentially silent regarding the use of these materials when manufactured into these components. These materials are used commonly in the construction of exterior decks.

The exception proposed for Section 48.10.3 was not accepted. The composite material is required to be subject to the ASTM E84/UL 723 test regardless.
52.3 Stationary storage battery systems.
Stationary storage battery systems shall be designed and constructed in accordance with the NFPA 1, Fire Code.

Statement of Problem and Substantiation for Public Input

Stationary battery systems are being used in an ever increasing number of applications in the built environment, including providing facility standby power, emergency power, uninterrupted power supplies and/or load shedding/load balancing applications. There are significant potential hazards associated with these systems, which are effectively addressed in the Fire Code. It is prudent to provide a link to these requirements to address these systems.

Submitter Information Verification

Submitter Full Name: HOWARD HOPPER
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 15:03:27 EDT 2015

Committee Statement

Statement: Stationary battery systems are being used in an ever increasing number of applications in the built environment, including providing facility standby power, emergency power, uninterrupted power supplies and/or load shedding/load balancing applications. There are significant potential hazards associated with these systems, which are effectively addressed in the Fire Code. It is prudent to provide a link to these requirements to address these systems.

The new annex note helps explain the purpose of this section.
53.1  General.

All plumbing systems and equipment shall be designed and installed in accordance with the following:

1. The installation of fuel gas distribution piping and equipment, fuel gas — fired water heaters, and water heater venting systems shall be designed and installed in accordance with NFPA 54/ANSI Z233.1, National Fuel Gas Code.

2. The installation of liquefied gas distribution piping, equipment, and systems shall be designed and installed in accordance with NFPA 58, Liquefied Petroleum Gas Code.

3. The installation of piping and equipment in health care facilities shall be designed and installed in accordance with NFPA 99, Health Care Facilities Code.

4. All other plumbing systems shall be designed and installed in accordance with the 2003 edition of the Uniform Plumbing Code.

Statement of Problem and Substantiation for Public Input

Chapter 2 references the appropriate edition of the UPC.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA's Building Code Development Committee (BCDC)
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 18:43:30 EDT 2015

Committee Statement

Statement: Chapter 2 references the appropriate edition of the UPC.
Public Input No. 35-NFPA 5000-2015 [ New Section after 54.12.1.1 ]

Fire Access Elevator Hoistway Enclosure
Each fire service access elevator shall be enclosed by a separate hoistway.

Statement of Problem and Substantiation for Public Input

The intent of this proposal is to avoid having any of the two fire access elevators taken out of service as a result of doing repair or maintenance in the other elevators that share the same hoistway during the fire incident.

Submitter Information Verification

Submitter Full Name: MOHAMED MOHAMED
Organization: ROLF JENSEN AND ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 01 05:29:00 EDT 2015

Committee Statement

Resolution: The committee questions the validity of the statement that taking one elevator out of service will compromise the hoistway to the extent that it needs to be separated.
54.12.2.2.1
Each Not less than one fire service access elevator lobby shall have direct access to an exit stair enclosure. Other fire access elevators not provided with lobbies shall be provided with signs indicating that no lobby is provided.

Statement of Problem and Substantiation for Public Input

Architects are reluctant to provide the fire access elevator lobby for both fire access elevator. The requirement should be relaxed to allow for the other fire access elevator to avoid the fire access elevator lobby. This is observed in small footprint buildings that maximize the efficiency of utilizing the circulation and corridor space. Therefore, the could not be any space available to provide for a second fire access elevator lobby. While the main reason for requiring two fire access elevators is to make sure that the second elevator is always available for use when the first one is out of service, fire-fighters should be able to use the other elevator identified with a sign as (without access lobby) to stop below the fire floor and allowfire fighters to transfer to the exit stair that connects to the other fire access elevator lobby and utilize the lobby as the staging space on the fire floor.

Submitter Information Verification

Submitter Full Name: MOHAMED MOHAMED
Organization: ROLF JENSEN AND ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 01 05:19:18 EDT 2015

Committee Statement

Resolution: The PI creates a difficult field situation for fire service to identify which fire service elevator has a lobby and which does not during an emergency.
54.12.2.2.2
The exit stair enclosure shall also have access to the floor without passing through the fire service access elevator lobby.

Exception: Where the floor is served by not less than two other exit stair enclosures complying with 11.5.1.4 that can be accessed without traversing through the fire service access elevator lobby.

Statement of Problem and Substantiation for Public Input

Architects are finding difficulties to allocate a second door for the exit stair that connects to the fire access elevator lobby without passing through the elevator lobbies. Most of architects are not aware of this requirement and are reluctant to reconfigure the floor arrangement. Therefore, it is effective to give credit to the presence of two other stairs within the floor as alternative to the other door that does not connect to the fire access elevator lobby.

Submitter Information Verification

Submitter Full Name: MOHAMED MOHAMED
Organization: ROLF JENSEN AND ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 01 04:37:23 EDT 2015

Committee Statement

Resolution: The PI does not comply with the NFPA Manual of Style. The committee likes the concept and suggests the submitter correct the style and submit a public comment.
Public Input No. 172-NFPA 5000-2015 [Section No. 55.1.4]

55.1.4 Inspection, Maintenance, and Testing.

55.1.4.1 Fire protection systems and equipment shall have an approved inspection, maintenance, and testing program complying with the requirements of the standards referenced herein and NFPA 1, *Fire Code*.

55.1.4.2 Where fire alarm systems are integrated with other building systems and equipment, the integrated systems shall be tested in accordance with *NFPA 4, Standard for Integrated Fire Protection and Life Safety Systems*.

A.55.1.4.1 It is also recommended that fire protection and life safety systems be commissioned in accordance with *NFPA 3, Recommended Practice for Commissioning of Fire Protection and Life Safety Systems*.

Statement of Problem and Substantiation for Public Input

To improve the reliability of integrated fire protection and life safety systems, NFPA 4 should be referenced.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
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<tbody>
<tr>
<td>Public Input No. 173-NFPA 5000-2015 [Section No. H.1.1]</td>
<td></td>
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<tr>
<td>Public Input No. 174-NFPA 5000-2015 [Section No. 2.2]</td>
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</tbody>
</table>

Submitter Information Verification

Submitter Full Name: THOMAS HAMMERBERG
Organization: AUTOMATIC FIRE ALARM ASSOCIATION
Affiliation: Automatic Fire Alarm Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 08:41:29 EDT 2015

Committee Statement

Resolution: FR-1502-NFPA 5000-2015
Statement: To improve the reliability of integrated fire protection and life safety systems, NFPA 4 should be referenced. (From PI-172)

New Annex A material is also being added.
Mass Notification

55.2 College and University Mass Notification Systems Risk Analysis.

55.2.1 College and University campuses shall conduct a Risk Analysis for Mass Notification in accordance with NFPA 72, National Fire Alarm and Signaling Code.

55.3 College and University Emergency Response Plan.

55.3.1 An emergency response plan shall be developed for each College and University Campus building based on the Risk Analysis and NFPA 1600.

Statement of Problem and Substantiation for Public Input

The purpose for this Public Input seeks to provide a requirement that every new College and University Campus building conduct a Risk Analysis and create an Emergency Response Plan for their facility. The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security and our educational occupancies. We have learned from the recent incidents that occurred in our college/university campuses and other buildings, and have created installation guidelines to be followed for Life Safety. [Aurora, CO. Theater 2012; Columbine 1999; Virginia Tech 2007; Sandy Hook 2012; Weather Tornadoes/Storms].

NFPA 72 National Fire Alarm and Signaling Code has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the Risk Analysis and Emergency Response Plan as required in the above proposed sections.

This is NOT intended to require a Mass Notification System in every College and University Campus building occupancy. There are many elements contained within a Mass Notification System, the process of the Risk Analysis will outline what is needed based on Risk and engineering study for the occupancy. It will be the responsibility of the education occupancy to react to the Risk Assessment.

An Emergency Response Plan will be needed for each College and University Campus building.

Submitter Information Verification

Submitter Full Name: PAUL MARTIN
Organization: NEW YORK DIVISION OF HOMELAND
Affiliation: Center for Campus Fire Safety
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jul 01 14:32:08 EDT 2015

Committee Statement

Resolution: FR-1505-NFPA 5000-2015
Statement: The purpose of this revision is to provide a requirement to conduct a risk analysis and create an emergency action plan for the facility. The need for effective emergency communications in the United States came into sharp focus in the 20th century in response to threats to homeland security and our educational occupancies. We have learned from the recent incidents that occurred in our college/university campuses and other buildings, and have created installation guidelines to be followed for life safety. [Aurora, CO. Theater 2012; Columbine 1999; Virginia Tech 2007; Sandy Hook 2012; Weather Tornadoes/Storms].

The National Fire Protection Association (NFPA) School Safety, Codes and Security Workshop, was held December 3–4, 2014, in College Park, Maryland, and was sponsored and hosted by NFPA. This report highlights the need for real time communication systems in appropriate occupancies.

NFPA 72, National Fire Alarm and Signaling Code, has a chapter dedicated to Emergency Communication Systems. This contains the detailed information on the risk analysis and emergency action plan as required in the above proposed sections.

This is NOT intended to require a mass notification system. There are many elements contained within a mass notification system, the process of the risk analysis will outline what is needed based on risk and engineering study for the occupancy. It will be the responsibility of the occupancy to react to the risk assessment.

A task group has been appointed to further review the location of the material in Ch. 55. The committee requests the Correlating Committee review this action in conjunction with related actions by the TC on Fundamentals and the occupancy committees to ensure the provisions are appropriately coordinated. The committee also requests the CC review the scope of BLD-BSF to recommend any needed changes to accommodate the addition of the proposed language.

The task group will also address the reference to an emergency action plan, which is not currently required by NFPA 5000.
Standards Council Decision #14-1 directed the NFPA Technical Committees to discontinue requirements for the storage and retail sales of consumer fireworks. As such, these facilities are not addressed by NFPA 5000.

Statement of Problem and Substantiation for Public Input

Standards Council Decision #14-1 directed the NFPA Technical Committees to discontinue requirements for the storage and retail sales of consumer fireworks. The Council then directed and subsequently issued a series of TIA’s removing any requirements for consumer fireworks from NFPA codes and standards. Unfortunately the TIA’s did not accomplish the intent of the Council Decision; but rather, created an unacceptable situation in which consumer fireworks are currently treated as ordinary hazard contents by the various NFPA codes and standards. Instead of not addressing the retail sales of consumer fireworks, NFPA 5000 now treats such facilities as a mercantile occupancy with ordinary hazard contents. In order to accomplish the directive issued by the Council, the storage and retail sales of consumer fireworks needs to be specifically excluded from the scope of NFPA 5000.

While the APA continues to believe that the Council Decision was based on false and misleading information and that the resulting action is contrary to NFPA’s mission of “eliminating death, injury, property and economic loss due to fire, electrical and related hazards”, the APA submits the Public Input to correct the errors made in implementing the Council Decision.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 170-NFPA 5000-2015</td>
<td>Annex note addressing proposed new language to 1.3.1</td>
</tr>
</tbody>
</table>

Submitter Information Verification

Submitter Full Name: WILLIAM KOFFEL
Organization: KOFFEL ASSOCIATES INC
Affiliation: American Pyrotechnics Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 07:57:56 EDT 2015

Committee Statement

Resolution: FR-6082-NFPA 5000-2015
Statement: The annex text adequately explains the need for such text.

**Statement of Problem and Substantiation for Public Input**

This simply adds the alternate equivalent (ASTM) standard, which is referenced throughout NFPA 5000 each time that NFPA 253 is mentioned, with this as an exception.

**Submitter Information Verification**

Submitter Full Name: MARCELO HIRSCHLER  
Organization: GBH INTERNATIONAL  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Thu Jun 04 14:19:11 EDT 2015

**Committee Statement**

Resolution: FR-5503-NFPA 5000-2015  
Statement: Revision adds the equivalent ASTM standard which is consistent with other references to NFPA 253 throughout the Code.
A.3.3.220.4 Such partitions are intended to include washroom water closet partitions.

Statement of Problem and Substantiation for Public Input

This is the annex note moved from A.10.1.3 and referring to interior wall finish.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
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<tr>
<td>Public Input No. 64-NFPA 5000-2015 [Section No. 3.3.220.4]</td>
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</table>

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER  
Organization: GBH INTERNATIONAL  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Jun 22 21:33:45 EDT 2015

Committee Statement

Resolution: FR-5501-NFPA 5000-2015  
Statement: This annex note is currently associated with A.10.1.3 but it belongs here to provide additional clarification on the application of interior wall finish.
A.3.3.567 Self-Preservation (Day-Care Occupancy).

Examples of clients who are incapable of self-preservation include infants, clients who are unable to use stairs because of confinement to a wheelchair or other physical disability, and clients who cannot follow directions or a group to the outside of a facility due to mental or behavioral disorders. It is the intent of this Code to classify children under the age of 24 months as incapable of self-preservation. Examples of direct intervention by staff members include carrying a client, pushing a client outside in a wheelchair, and guiding a client by direct hand-holding or continued bodily contact. If clients cannot exit the building by themselves with minimal intervention from staff members, such as verbal orders, classification as incapable of self-preservation should be considered.

Statement of Problem and Substantiation for Public Input

In accordance with the Fire Protection Research Foundation's "Determining Self-Preservation Capability in Pre-School Children (September 2013), I propose that the TC debate increasing the age at which a majority of children are considered capable of self-preservation to 30 months. Make any other adjustments/correlations to any code sections in NFPA 101 and NFPA 5000 and NFPA 101A that relate to the present 24 month age provision being increased.

Submitter Information Verification

Submitter Full Name: ALEKSY SZACHNOWICZ  
Organization: ANNE ARUNDEL COUNTY PUBLIC SCH

Committee Statement

Resolution: FR-3011-NFPA 5000-2015  
Statement: In accordance with the Fire Protection Research Foundation's "Determining Self-Preservation Capability in Pre-School Children (September 2013), the First Revision increases the age at which a majority of children are considered capable of self-preservation to 30 months.
A.4.5.8.1.1.1 The process of correcting or repairing an impairment should begin as soon as the impairment is discovered. If the necessary parts are on hand the correction or repair can be accomplished in a matter of a few hours. However, in many cases, it may take several days to order repair parts, have them shipped, and schedule manpower to make the repair.

A.4.5.8.1.1.2 The process of correcting or repairing a critical deficiency should begin as soon as it is discovered and with a sense of urgency. If the necessary parts are on hand the correction or repair can be accomplished in a matter of a few hours. However, in many cases it may take several days to order repair parts, have them shipped, and schedule manpower to make the repair. There are very few instances when a critical deficiency cannot be corrected or repaired within 30 days.

A.4.5.8.1.1.3 Non-critical deficiencies do not have an effect on system performance and therefore correcting or repairing them is allowed to take longer.

Statement of Problem and Substantiation for Public Input

This language sets specific time frames for corrective action to remedy impairments, critical deficiencies, and non-critical deficiencies identified by NFPA 25.

Related Public Inputs for This Document

<table>
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<tr>
<th>Related Input</th>
<th>Relationship</th>
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<tr>
<td>Public Input No. 211-NFPA 5000-2015 [New Section after 4.5.8.1]</td>
<td>Main PI in body of standard</td>
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</tbody>
</table>

Submitter Information Verification

Submitter Full Name: ROBERT UPSON  
Organization: NATIONAL FIRE SPRINKLER ASSOCIATION  
Affiliation: National Fire Sprinkler Association  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Jul 06 15:01:06 EDT 2015

Committee Statement

Resolution: The proposed associated Code requirements were not added to Chapter 4. As such, advisory annex text would not be appropriate.
The system of designating types of construction also includes a specific breakdown of the types of construction through the use of arabic numbers. These arabic numbers follow the roman numeral notation where identifying a type of construction [e.g., Type I(442), Type II(111), Type III(200)] and indicate the fire resistance rating requirements for certain structural elements as follows:

1. First arabic number — exterior bearing walls
2. Second arabic number — columns, beams, girders, trusses and arches, supporting bearing walls, columns, or loads from more than one floor
3. Third arabic number — floor construction

Where Table 7.2.1.1 references Floor/Ceiling Assemblies or Roof/Ceiling Assemblies, the term assembly refers to a combination of materials comprising the walking surface of the floor or the exterior surfaces of the roof, horizontal supporting construction and possibly the ceiling membrane. Typically such assemblies include the walking surface of the floor or the exterior surfaces of the roof, all horizontal structural members (elements) supporting the walking surface of the floor or the exterior surfaces of the roof. Where the assembly has a fire resistance rating, cavity insulation, ceiling membrane layers affixed or suspended from the underside of the horizontal structural members (elements), and any required opening protection for penetrations such as but not limited to recessed lights, HVAC diffusers, penetrating cables, or pipes are regulated. See Section 8.6 for requirements governing horizontal assemblies having a fire resistance rating. See Section 8.12.1.1(1) for horizontal assemblies not having a fire resistance rating.

Table A.7.2.1.1 provides a comparison of the types of construction for various model building codes.

<table>
<thead>
<tr>
<th>NFPA 5000</th>
<th>I(442)</th>
<th>I(332)</th>
<th>II(222)</th>
<th>II(111)</th>
<th>II(000)</th>
<th>III(211)</th>
<th>III(200)</th>
<th>IV(2HH)</th>
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<tr>
<td>UBC</td>
<td>—</td>
<td>I FR</td>
<td>II FR</td>
<td>II 1 hr</td>
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<td>III 1 hr</td>
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<td>2B</td>
<td>2C</td>
<td>3A</td>
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<td>II A</td>
<td>II B</td>
<td>III A</td>
<td>III B</td>
<td>IV</td>
<td>VA</td>
<td>VB</td>
</tr>
</tbody>
</table>

FR: Fire rated.
N: Nonsprinklered.
HT: Heavy timber.
UNP: Unprotected.

Statement of Problem and Substantiation for Public Input

Added worded will assist users in understanding what is meant by the term assembly
<table>
<thead>
<tr>
<th>Submitter Information Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Submitter Full Name:</strong> JOSEPH VERSTEEG</td>
</tr>
<tr>
<td><strong>Organization:</strong> VERSTEEG ASSOCIATES</td>
</tr>
<tr>
<td><strong>Affiliation:</strong> self</td>
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<td><strong>Street Address:</strong></td>
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<tr>
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<td><strong>Zip:</strong></td>
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<tr>
<td><strong>Submittal Date:</strong> Mon Jul 06 11:04:59 EDT 2015</td>
</tr>
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</table>

<table>
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<tr>
<th>Committee Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution:</strong> FR-1004-NFPA 5000-2015</td>
</tr>
<tr>
<td><strong>Statement:</strong> The added wording will assist users in understanding what is meant by the term assembly.</td>
</tr>
</tbody>
</table>
A8.2.2.1.1
Over the life of a building, fire resistive and smoke rated walls, partitions and floors can become compromised through the installation of utilities, and remodeling. NFPA 70 at section 300-21 has language to support this code change; “300.21 Spread of Fire or Products of Combustion. Electrical installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations into or through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.” as such, the benefit of compartmentation intended and incorporated in the original design can be lost causing the spread of smoke and fire and a premature failure of the building structure. Labeling is intended to be visible only in concealed spaces where access is commonly provided. The 20 foot maximum spacing is intended to ensure that the labeling will be evident should the concealed space be interrupted by intersecting partitions or obstructions.

Statement of Problem and Substantiation for Public Input

Over time, the chances are high of a rated wall being compromised in attic spaces. This is done by contractors, workers and occupants. Marking the rated wall as described will help maintain the integrity of the rating which is important for the life of the building.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
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</thead>
<tbody>
<tr>
<td>Public Input No. 119-NFPA 5000-2015 [New Section after 8.2.2.1]</td>
<td></td>
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</tbody>
</table>

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA’s Building Code Development Committee (BCDC)
Street Address:
City: 
State: 
Zip: 
Submittal Date: Sat Jul 04 17:06:02 EDT 2015

Committee Statement

Resolution: FR-3501-NFPA 5000-2015
Statement: This proposal supports the concept covered by Public Input 119 and 121 for marking fire and smoke rated walls. It clarifies the following points:

The requirements are placed in the general section in Chapter 8 so they are applicable for fire barriers, smoke barriers, and smoke partitions.
Wall markings are only required for assemblies covered by NFPA 101 and NFPA 5000.

The markings are only required for walls that have accessible concealed spaces, and the markings are to be provided in the concealed spaces.
Public Input No. 60-NFPA 5000-2015 [ Section No. A.10.1.3 ]

A.10.1.3 —
Such partitions are intended to include washroom water closet partitions.

Statement of Problem and Substantiation for Public Input

This reference is misapplied - it should refer to the definition of interior finish in chapter 3.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jun 22 20:58:31 EDT 2015

Committee Statement

Resolution: FR-5501-NFPA 5000-2015
Statement: This annex note is currently associated with A.10.1.3 but it belongs here to provide additional clarification on the application of interior wall finish.
The requirements pertaining to interior finish are intended to restrict the spread of fire over the continuous surface forming the interior portions of a building.

Table A.10.2 shows the fire test methods and classification criteria that apply to different interior finish materials.

<table>
<thead>
<tr>
<th>Material Test Method Acceptance Criterion</th>
<th>Application Requirement</th>
<th>Paragraph Interior wall and ceiling finish materials, except as shown below in this table</th>
</tr>
</thead>
</table>
| Textile wall coverings ASTM E 84 or UL 723 Class A | in accordance with 10.3.2.1 | As required by relevant sections 10.3.1 - ASTM E 84 or UL 723 Class B, in accordance with 10.3.2.2 As required by relevant sections 10.3.1 - ASTM E 84 or UL 723 Class C, in accordance with 10.3.2.3 As required by relevant sections 10.3.1 - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.3.1.2 Materials having a thickness less than \( \frac{1}{28} \) in. (0.9 mm) applied directly to a noncombustible or limited combustible surface of walls or ceilings - No testing required - 10.1.2 Exposed portions of structural members complying with the requirements for buildings of Type IV (2HH) construction, in accordance with 7.2.5 - No testing required - 10.3.1.1 Cellular or foamed plastics (exposed foamed plastics and foamed plastics used in conjunction with a textile or vinyl facing or cover) - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.3.1, Section 48.5 - FM 4880 Pass Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.3.1, Section 48.5 - UL 1040 Pass Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.3.1, Section 48.5 - UL 1715 Pass Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.3.1, Section 48.5 - A suitable large-scale fire test that substantiates their combustibility characteristics for the use intended under actual fire conditions Pass Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.3.1, Section 48.5 - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.3.1.2 - Method B In accordance with 10.3.6.1 Permitted on walls and partitions 10.4.1(4) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted on walls, but also requires sprinklers per Section 55.3 10.4.1(1) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted 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 10.4.1(2) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions 10.4.1(3) - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.3.6.2 Method B In accordance with 10.3.6.1 Permitted on walls and partitions 10.4.1(4) - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.2(5) - NFPA 265, Method B In accordance with 10.3.6.1 Permitted on walls and partitions 10.4.2(4) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted on walls, but also requires sprinklers per Section 55.3 10.4.2(1) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted 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 10.4.2(2) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions 10.4.2(3) Textile ceiling coverings - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.3.1.2 - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted on walls, but also requires sprinklers per Section 55.3 10.4.1(1) Expanded vinyl ceiling coverings - NFPA 286 In accordance with 10.3.6.2 Permitted where Class A, Class B, or Class C is required by relevant sections 10.4.2(5) - ASTM E 84 or UL 723 Class A, in accordance with 10.3.2.1 Permitted on walls, but also requires sprinklers per Section 55.3 10.4.2(1) Interior trim, other than foamed plastic and other than wall base - ASTM E 84 or UL 723 Class C, in accordance with 10.3.6.2 Interior wall and ceiling trim and incidental finish, other than wall base not in excess of 10 percent of the specific wall and ceiling areas of any room or space to which it is applied in occupancies where interior wall and ceiling finish of Class A or Class B is required 10.5.1 - NFPA 286 In accordance with 10.3.6.2 Permitted where
Class A, Class B, or Class C is required by relevant sections 10.3.1.2. Foamed plastic used as interior trim shall be ASTM E 84 or UL 723 Flame spread index ≤ 75. (1) Minimum density of interior trim required to be 20 lb/ft³ (320 kg/m³). (2) Maximum thickness of interior trim required to be 0.5 in. (13 mm), and maximum width permitted to be 8 in. (205 mm). (3) Interior trim not permitted to constitute more than 10 percent of specific wall or ceiling area of a room or space to which it is applied. 10.5.1, 48.5.3.

ASTM D 2859 Pass All areas 10.6.1 Floor coverings, other than carpet, that are judged to represent an unusual hazard (excluding traditional finish floors and floor coverings, such as wood flooring and resilient floor coverings). NFPA 253 or ASTM E 648 CFR ≥ 0.1 W/cm². All areas 10.6.2 Interior floor finish, other than carpet and carpetlike materials. NFPA 253 or ASTM E 648 Class I: CFR ≥ 0.45 W/cm², in accordance with 10.6.4.1. As required by relevant sections 10.6.3. NFPA 253 or ASTM E 648 Class II: CFR ≥ 0.22 W/cm², in accordance with 10.6.4.2. As required by relevant sections 10.6.3. 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]. NFPA 253 or ASTM E 648 Class I: CFR ≥ 0.45 W/cm², in accordance with 10.6.4.1. All areas 10.5.2. NFPA 253 or ASTM E 648 Class II: CFR ≥ 0.22 W/cm², in accordance with 10.6.4.2. If interior floor finish is required to meet Class I CFR 10.5.2. Floor finish of traditional type, such as wood flooring and resilient floor coverings. NFPA 253 or ASTM E 648 Class I: CFR ≥ 0.45 W/cm², in accordance with 10.6.4.1. All areas 10.5.2. NFPA 253 or ASTM E 648 Class II: CFR ≥ 0.22 W/cm², in accordance with 10.6.4.2. If interior floor finish is required to meet Class I CFR 10.5.2. Floor finish of traditional type, such as wood flooring and resilient floor coverings. No testing required. Section 10.6.

The default requirements are based on fire testing to NFPA 286 (with the criteria of 10.2.3.2), which apply to all interior finish materials. Many interior finish materials are permitted to be tested based on other fire tests (namely, based either on ASTM E84 or UL 723 or on NFPA 265), as shown in the relevant sections.

Table A.10.2 shows the fire test methods and classification criteria that apply to different interior wall and ceiling finish materials.

Table A.10.2 Fire Testing of Interior Wall and Ceiling Finish Materials

(Replace the table by the attached table)

Additional Proposed Changes

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
<th>Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>5000_A10.2_including_table_proposed_for_2018.docx</td>
<td>Revised section A10.2 including revised table</td>
<td></td>
</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Input

The table contains multiple errors that have been revised. The proposed new table is consistent with the proposed new text for 10.2. The sections of the table dealing with interior floor finish are being deleted because they are unnecessary as the text in the body is clear enough.

Related Public Inputs for This Document

<table>
<thead>
<tr>
<th>Related Input</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input No. 53-NFPA 5000-2015 [Section No. 10.2]</td>
<td></td>
</tr>
</tbody>
</table>

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Committee Statement

Resolution:

Statement: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
A.10.2

The requirements pertaining to interior finish are intended to restrict the spread of fire over the continuous surface forming the interior portions of a building. The default requirements are based on fire testing to NFPA 286 (with the criteria of 10.2.3.2), which apply to all interior finish materials. Many interior finish materials are permitted to be tested based on other fire tests (namely, based either on ASTM E84 or UL 723 or on NFPA 265), as shown in the relevant sections. Table A.10.2 shows the fire test methods and classification criteria that apply to different interior wall and ceiling finish materials.

### Table A.10.2 Fire Testing of Interior Wall and Ceiling Finish Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Test Method</th>
<th>Acceptance Criterion</th>
<th>Application Requirement</th>
<th>Paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>All interior wall and ceiling finish materials</td>
<td>NFPA 286</td>
<td>In accordance with 10.2.3.2</td>
<td>Permitted anywhere, including where Class A, Class B or Class C in accordance with ASTM E84 or UL 723 is required by relevant sections</td>
<td>10.2.3.1</td>
</tr>
<tr>
<td>Materials having a thickness less than (\frac{1}{28}) in. (0.9 mm) applied directly to a noncombustible or limited combustible surface of walls or ceilings</td>
<td>No testing required</td>
<td></td>
<td></td>
<td>10.2.4.1</td>
</tr>
<tr>
<td>Exposed portions of structural members complying with the requirements for buildings of Type IV (2HH) construction, in accordance with 7.2.5</td>
<td>No testing required</td>
<td></td>
<td></td>
<td>10.2.4.2</td>
</tr>
<tr>
<td>Cellular or foamed plastics (exposed foamed plastics and foamed plastics used in conjunction with a textile or vinyl facing or cover)</td>
<td>NFPA 286</td>
<td>In accordance with 10.2.3.2</td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.3.1, Section 48.5</td>
</tr>
<tr>
<td>FM 4880</td>
<td>Pass</td>
<td></td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.3.1, Section 48.5</td>
</tr>
<tr>
<td>UL 1040</td>
<td>Pass</td>
<td></td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.3.1, Section 48.5</td>
</tr>
<tr>
<td>UL 1715</td>
<td>Pass</td>
<td></td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.3.1, Section 48.5</td>
</tr>
<tr>
<td>Material</td>
<td>Test Method</td>
<td>Acceptance Criterion</td>
<td>Application Requirement</td>
<td>Paragraph</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------</td>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Textile wall coverings</td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance with 10.3.2.3</td>
<td>Permitted on walls, but also requires sprinklers per Section 55.3. As required by relevant sections. Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.4</td>
</tr>
<tr>
<td></td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance with 10.3.2.3</td>
<td>Permitted 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. Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.4</td>
</tr>
<tr>
<td></td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance with 10.3.2.3</td>
<td>Permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions. Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.4</td>
</tr>
<tr>
<td></td>
<td>NFPA 265 Method B</td>
<td>In accordance with 10.2.4.4.2</td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.4.2</td>
</tr>
<tr>
<td>Expanded vinyl wall coverings</td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance with 10.3.2.3</td>
<td>Permitted on walls, but also requires sprinklers per Section 55.3. As required by relevant sections Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.5</td>
</tr>
<tr>
<td></td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance with 10.3.2.3</td>
<td>Permitted 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 Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.5</td>
</tr>
<tr>
<td></td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance with 10.3.2.3</td>
<td>Permitted to extend not more than 48 in. (1220 mm) above the finished floor on ceiling-height walls and ceiling-height partitions Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.5</td>
</tr>
<tr>
<td></td>
<td>NFPA 265 Method B</td>
<td>In accordance with 10.2.4.4.2</td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.5</td>
</tr>
<tr>
<td>Material</td>
<td>Test Method</td>
<td>Acceptance Criterion</td>
<td>Application Requirement</td>
<td>Paragraph</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------------------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Textile ceiling coverings</td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance</td>
<td>Permitted on ceilings, but also requires sprinklers per Section 55.3 Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.2.4.6</td>
</tr>
<tr>
<td>Expanded vinyl ceiling coverings</td>
<td>ASTM E84 or UL 723</td>
<td>Class A, in accordance</td>
<td>Permitted on ceilings, but also requires sprinklers per Section 55.3 Tested using specimen preparation and mounting per ASTM E2404</td>
<td>10.4.2.7</td>
</tr>
<tr>
<td>Interior trim, other than foamed plastic and other than wall base</td>
<td>ASTM E84 or UL 723</td>
<td>Class C, in accordance</td>
<td>Interior wall and ceiling trim and incidental finish, other than wall base not in excess of 10 percent of the specific wall and ceiling areas of any room or space to which it is applied in occupancies where interior wall and ceiling finish of Class A or Class B is required</td>
<td>10.2.5.1</td>
</tr>
<tr>
<td>Foamed plastic used as interior trim</td>
<td>ASTM E84 or UL 723</td>
<td>Flame spread index not exceeding 75</td>
<td>(1) Minimum density of interior trim required to be 20 lb/ft^3 (320 kg/m^3)</td>
<td>10.2.4.3.2, 48.5.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2) Maximum thickness of interior trim required to be 0.5 in. (13 mm), and maximum width permitted to be 8 in. (205 mm)</td>
<td>10.2.4.3.2, 48.5.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3) Interior trim not permitted to constitute more than 10 percent of specific wall or ceiling area of a room or space to which it is applied.</td>
<td>10.2.4.3.2, 48.5.3</td>
</tr>
<tr>
<td>Wall base</td>
<td>Tested as interior floor finish</td>
<td></td>
<td>Shall not exceed 6 in. (150 mm) in height</td>
<td>10.2.5.2</td>
</tr>
<tr>
<td>Lockers</td>
<td>Tested as interior finish</td>
<td></td>
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<td>10.2.4.8</td>
</tr>
<tr>
<td>Wood lockers</td>
<td>ASTM E84 or UL 723</td>
<td>Class C, in accordance</td>
<td>No testing required</td>
<td>10.2.4.8.2</td>
</tr>
<tr>
<td>Polypropylene and High density polyethylene</td>
<td>NFPA 286</td>
<td>In accordance with 10.2.3.2</td>
<td>Permitted where Class A, Class B, or Class C is required by relevant sections</td>
<td>10.2.4.9</td>
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<tr>
<td>Site-Fabricated Stretch Systems</td>
<td>ASTM E84 or UL 723</td>
<td>Tested using specimen preparation and mounting per ASTM E2573</td>
<td></td>
<td>10.2.4.10</td>
</tr>
<tr>
<td>Material</td>
<td>Test Method</td>
<td>Acceptance Criterion</td>
<td>Application Requirement</td>
<td>Paragraph</td>
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<td>----------------------------------------------------</td>
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<tr>
<td>Reflective Insulation Materials</td>
<td>ASTM E84 or UL 723</td>
<td>Tested using specimen preparation and mounting per ASTM E2599</td>
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<td>10.2.4.11</td>
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<tr>
<td>Metal Ceiling and Wall Panels</td>
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<td>10.2.4.12</td>
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<tr>
<td>Laminated products factory-produced with a wood substrate</td>
<td>ASTM E84 or UL 723</td>
<td>Tested using specimen preparation and mounting per ASTM E2579</td>
<td></td>
<td>10.2.4.13</td>
</tr>
<tr>
<td>Facings or wood veneers intended to be applied on site over a wood substrate</td>
<td>ASTM E84 or UL 723</td>
<td>Tested using specimen preparation and mounting per ASTM E2404</td>
<td></td>
<td>10.2.4.14</td>
</tr>
<tr>
<td>Light transmitting plastics</td>
<td></td>
<td></td>
<td></td>
<td>10.2.4.15</td>
</tr>
<tr>
<td>Fire retardant coatings</td>
<td></td>
<td>Not permitted for compliance</td>
<td></td>
<td>10.2.3.6</td>
</tr>
<tr>
<td>Factory-applied fire retardant coated products listed and labeled for the application</td>
<td>ASTM E2768 Pass</td>
<td></td>
<td></td>
<td>10.2.3.7</td>
</tr>
</tbody>
</table>
The methodology specified in 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, includes provisions for measuring smoke obscuration. Such measurement is considered desirable, but the basis for specific recommended values is not currently available. [See A.10.5.1 (4)(4).]

Statement of Problem and Substantiation for Public Input

The sentence struck out refers to older editions of NFPA 265 and older editions of the code, which were not clear about smoke measurements. The reference struck out was to an Annex section that no longer exists.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jun 22 21:19:03 EDT 2015

Committee Statement

Resolution: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting.
practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
Public Input No. 63-NFPA 5000-2015 [Section No. A.10.4.5.1]

A.10.4.5.1
See A.10.4.5 and A.10.5.1(4).

Statement of Problem and Substantiation for Public Input

The referenced Annex section does not exist.

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address:
City:
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Zip:
Submittal Date: Mon Jun 22 21:24:42 EDT 2015

Committee Statement

Resolution:
Statement: 10.2 (all): This reorganizes section 10.2 for a more logical organization but it does not change any of the requirements. The key issue is to recognize that the default test for assessing interior finish fire safety requirements is NFPA 286 (room-corner test) because any interior finish material is allowed to be tested to NFPA 286, while not all materials are allowed to be tested to ASTM E84 or to NFPA 265. In fact, foam plastics, HDPE and PP are not allowed to be tested to ASTM E84. Moreover, both textile wall and ceiling coverings and expanded vinyl wall coverings and ceiling coverings are only allowed to be tested to ASTM E84 under certain conditions. Also, while textile and expanded vinyl wall coverings are allowed to be tested to NFPA 265, neither textile nor expanded vinyl ceiling coverings are permitted to be tested to NFPA 265. Also, several materials are required to use special mounting methods in order to be tested to ASTM E84. Finally, this reorganization does incorporate both the very thin linings (< 1/28 of an inch) and the exposed portions of structural members in the same sections as all other products, while not changing the requirements.

New sections are added addressing "Laminated products factory-produced with a wood substrate" and "Facings or wood veneers intended to be applied on site over a wood substrate", which places into the code requirements that have been developed within ASTM committee E05 on Fire Standards in new sections on ASTM E84 mounting practices (ASTM E2579 and ASTM E2404, respectively). They are proposed as sections 10.2.4.13 and 10.2.4.14, respectively.

10.2.4.13 (NEW) and 10.2.4.14 (NEW): ASTM has developed mounting methods for both "facings or wood veneer intended to be applied on site over a wood substrate" and laminated products that are factory produced and have a wood substrate. The concept is
that facings that are produced as part of a commercial (factory-produced) panel are finished products and the manufacturer should be responsible to ensure that the product itself (the full panel) is safe and there is no need to discuss a substrate. It has been shown that, when veneers are applied over a wood substrate the resulting flame spread is much higher than when applied over gypsum board or over a noncombustible substrate. Therefore the requirement in ASTM E2579 is that the testing be done with the full product and, thus, there will no need to retest for different substrates. Similarly, NFPA 286 contains a section that addresses testing of wall covering materials, including facings applied on site and laminated products produced in the factory. Facings applied on site over wood substrates are tested using ASTM E2404.

10.2.1.3 (revision): The text "constructed of combustible material" was deleted as lockers, regardless of material, are to be considered interior finish.

10.2.1.4 (NEW): The new language moves the current annex note from existing 10.1.3 into the body of the code to further clarify the application of interior finish requirements.

10.2.4.2 (revision) and A.10.2.4.2 (NEW): 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 those listed in this section.

A.10.2 through A.10.7.3: The reorganization to Section 10.2 through 10.8 in the Code have increased the the ease of application of the interior finish provisions and created a more user friendly and comprehensive set of provisions. Table A.10.2, which was developed to summarize the interior finish provisions is no longer needed. New language summarizing the organization of 10.2 has been added. The annex sections are also being moved to addressed the reorganization of Section 10.2.

A.10.4.5: The last sentence of current A.10.4.5 has been deleted as the sentence is obsolete as it refers to older editions of NFPA 265 and of the code.

A.10.4.5.1: The second referenced section has been deleted as it does not exist.
Note that research has identified that increased tread depth (also referred to as run or going in some countries codes and standards), beyond 13 inches to about 14 inches results in improved usability and safety. The research also indicates that tread depth up to about 17 inches performs as well as does the widely used minimum of 11 inches, the minimum used fairly generally in this Code for most stairs. Where space is available, 14-inch tread depths provide what might be referred to as optimum performance, with other tread depths within a range of 3 inches on either side of 14 inches performing acceptably well. The 13 inches used in 11.1.7.2.2 is acceptable for the special stairs it addressed, but depending on other factors with such special stairs, it might not be the best choice and a larger tread depth might work better, especially if the stair is bounded by large areas of step-free walking surfaces on which people use longer strides in their walking gait. Generally, the isolated nature of such steps will demand that, with conspicuous nosing marking and handrails, the steps will be seen reliably as they are approached in the more-critical descent direction.

Additional Proposed Changes

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<th>File Name</th>
<th>Description</th>
<th>Approved</th>
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<tr>
<td>UK_Study_of_Step_Dimensions_by_Wright_Roys.pdf</td>
<td>Graphic by Jake Pauls based on PPT slide from presentation, &quot;Effect of changing stair dimensions on safety,&quot; for which permission to use the slide has been granted by the author, Mike Roys (as noted on the graphic).</td>
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The proposal provides a basis for designer and regulatory official judgments about performance of tread depths larger than the minimum dimensions required by the Code. This is based on UK studies which have had major impact on improvements to stair safety requirements worldwide. Secondarily, the proposed Annex text clarifies what the Code-used term "tread depth" is called by other codes and standards outside the USA. This is important because of the Code’s use internationally and, in the Code, this requirement, 11.1.7.2.2, is the first place in the Code where the term, "tread depth," is used.

Submitter Information Verification

Submitter Full Name: JAKE PAULS
Organization: JAKE PAULS CONSULTING SERVICES
Street Address: 
City: 
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Submittal Date: Fri Jul 03 14:52:17 EDT 2015

Committee Statement

Resolution: The note is tied to 11.1.7.2.2 where the user might be misled to believe that the minimum 13 in. tread depth can be reduced to 11 in.
A.11.3.4.1.1 —

The criteria of 11.3.4.1.1, as initially written, were intended to provide for minimum widths for small spaces such as individual offices. The intent is that this exemption applies to spaces formed by furniture and movable walls so that accommodations can easily be made for mobility-impaired individuals. One side of a path could be a fixed wall, provided that the other side is movable. The exemption does not exempt the door widths or widths of fixed-wall corridors, regardless of the number of people or length. The allowance for reduction in width has been expanded to include all exit accesses serving not more than six people where the travel length along the reduced-width path does not exceed 50 ft (15 m), regardless of occupancy or use of the space.

Figure A.11.3.4.1.1 presents selected anthropometric data for adults. The male and female figures depicted in the figure are average, 50th percentile, in size. Some dimensions apply to very large, 97.5 percentile, adults (noted as 97.5 P).

**Figure A.11.3.4.1.1 Anthropometric Data for Adults — Male and Female Figures.**

**Statement of Problem and Substantiation for Public Input**

This is in conflict with the federal accessibility guidelines.

**Related Public Inputs for This Document**

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**Submitter Information Verification**
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<tr>
<th><strong>Submitter Full Name</strong></th>
<th>Jim Muir</th>
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<tr>
<td><strong>Organization</strong></td>
<td>Building Safety Division, Clark County, Washington</td>
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<tr>
<td><strong>Affiliation</strong></td>
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<tr>
<td><strong>Submittal Date</strong></td>
<td>Sat Jul 04 17:48:52 EDT 2015</td>
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**Committee Statement**

**Resolution:** The requirement to which this material is related was not deleted.
A12.33.1.2.2 It is not the intent to require changes to the design of the building itself to achieve access into the building. If the owner or builder chooses to place the building such that the vertical change of level between the floor level and the final grade exceeds 18 inches at every entrance (including front, back, side and garage entrances), the criteria of ICC/ANSI A117.1, Section 1005 would not apply. This is intended to allow buildings such as townhomes with garages beneath, historic brownstone reconstructions, and elevated structures in flood-prone areas to be constructed without requiring an accessible route to the entrance.

Statement of Problem and Substantiation for Public Input

This Annex language and the text to which it refers were developed by the NFPA 5000 Site Impracticality Task Group to better address the issue of access to one and two family dwelling units. The intent is to draft language that is easy for a homeowner to determine whether their building must comply and that is not over restrictive. The focus of the Task Group was on the 95% of new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: JOHN RICKARD
Organization: P3 CONSULTING
Affiliation: NFPA 5000 Building Systems Site Impracticality Task Group
Street Address: 
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State: 
Zip: 
Submittal Date: Fri Jul 03 15:17:07 EDT 2015

Committee Statement

Statement: This change and the new text that follows in 12.33.1.2.3 and 12.33.1.2.4, plus accompanying Annex language, were developed by the Site Impracticality Task Group of the Building Systems technical committee to better address the issue of access to one and two family dwelling units. The committee’s language makes it easier for a homeowner to determine whether their building must comply and it is not overly
restrictive. The focus of the Committee is to capture 95% of the new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.

This Annex language and the text to which it refers were developed by the NFPA 5000 Site Impracticality Task Group to better address the issue of access to one and two family dwelling units. The committee finds the language to be easier for a homeowner to determine whether their building must comply and that is not overly restrictive. The committee agrees with the focus of the Task Group to capture 95% of the new homes that can easily be made visitable in order to increase the stock of visitable homes without imposing an undue burden on those homes that are more difficult to make visitable. This is consistent with the recommendations of Concrete Change, an advocacy group for visitability.
Sections A.15.1.2.2.2, A.15.1.2.3.2

A.15.1.2.2.2 —

Table 15.1.2.2.2 - Use of FEMA 356, Prestandard and Commentary for the Seismic Rehabilitation of Buildings, requires the selection of a target building performance level at a specified earthquake hazard level. In most parts of the country, BSE-1 is consistent with the ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures, design level earthquake, and BSE-2 is consistent with the maximum considered earthquake (MCE).

A.15.1.2.3.2 —

Table 15.1.2.3.2 - The use of ASCE/SEI 31, Seismic Evaluation of Existing Buildings, and FEMA 356, Prestandard and Commentary for the Seismic Rehabilitation of Buildings, requires the selection of a target building performance level at a specified earthquake hazard level. In most parts of the country, the earthquake hazard in ASCE/SEI 31 and the BSE-1 are consistent with the ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures, design level earthquake, and BSE-2 is consistent with the maximum considered earthquake (MCE).

Statement of Problem and Substantiation for Public Input

ASCE 31 and FEMA 356 are no longer the correct references.

Related Public Inputs for This Document

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<td>Clean up on ASCE 31/FEMA 356.</td>
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Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
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Street Address: 
City: 
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Submittal Date: Mon Jul 06 15:02:58 EDT 2015

Committee Statement

Resolution: FR-6079-NFPA 5000-2015
Statement: ASCE 31 and FEMA 356 have been replaced with ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings. This FR cleans up the two sections.
A.18.1.1 Day-care occupancies do not provide for the full-time maintenance of a client. Occupancies that provide a primary place of residence are addressed in other occupancy chapters. The definition of day-care occupancy excludes day-care occupancies that are incidental to some other occupancy. In such cases, the requirements of the predominant occupancy apply. Examples of excluded facilities include the following:

1. Rooms located within places of worship used as nurseries or for supervision of children or religious education while services are being held in the building.

2. Rooms used for temporary child care during short-term recreational activities of the child’s relative or guardian, such as within a health club or park district.

3. Rooms used for temporary child care during other short-term activities such as court hearings or other similar scenarios.

Statement of Problem and Substantiation for Public Input

Application annex language for NFPA 5000 is not provided, while it is in NFPA 101. This revised explanatory language clarifies the scope of Chapter 18.

Submitter Information Verification

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Submittal Date: Fri Jun 26 15:14:53 EDT 2015

Committee Statement

Resolution: There is no text in Chapter 18 to back up the proposed exemptions the annex text would offer. Given that current 18.1.1.9 provides an exemption, these new categories belong in the chapter text near 18.1.1.9 as code-specified exemptions rather than as advice to the reader. A Public comment could be submitted asking for new exemptions within 18.1.1.
A.18.5.5 The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

A.18.5.5.1.1 Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A.18.5.5.2 A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

A.18.5.5.2.1 Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 18.5.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab bars.
bar options with 103 independent-living seniors with average age of 70. ("Evaluation of Optimal Bath Grab Bar Placement for Seniors," by H. Sveistrup, D. Lockett, N. Edwards and F. Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation, 2003.)

A 18.5.5.3.1 The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users' hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people's hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

Submitter Information Verification

Submitter Full Name: JAKE PAULS
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Affiliation: Myself and Linda Strobl, Public Health Nurse, Ontario
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sun Jul 05 15:11:08 EDT 2015

Committee Statement

Resolution: Chapter 11 annex text is sufficient. No need to duplicate in multiple places.
Title of New Content

A.19.5.5 The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

A.19.5.5.1.1 Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A.19.5.5.2 A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

A.19.5.5.2.1 Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 19.5.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab bars.
The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users' hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people's hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

Submitter Information Verification

Submitter Full Name: JAKE PAULS
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Affiliation: Myself and Linda Strobl, Public Health Nurse, Ontario
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jul 05 15:28:35 EDT 2015

Committee Statement

Resolution: Chapter 11 annex text is sufficient. No need to duplicate in multiple places.
The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 20.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab
bar options with 103 independent-living seniors with average age of 70. ("Evaluation of Optimal Bath Grab Bar Placement for Seniors," by H. Sveistrup, D. Lockett, N. Edwards and F. Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation, 2003.)

A. 20.5.5.3.1 The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users' hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people's hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

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Committee Statement

Resolution: Chapter 11 annex text is sufficient. No need to duplicate in multiple places.
A.22.5.5 The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

A.22.5.5.1.1 Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A.22.5.5.2 A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

A.22.5.5.2.1 Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 22.5.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.
bar options with 103 independent-living seniors with average age of 70. ("Evaluation of Optimal Bath Grab Bar Placement for Seniors," by H. Sveistrup, D. Lockett, N. Edwards and F. Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation, 2003.)

A. 22.5.5.3.1 The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users' hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people's hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

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Submittal Date: Sun Jul 05 15:37:33 EDT 2015

Committee Statement

Resolution: The proposed Annex A language has been incorporated into the related Section A.11.X provisions.
A.23.5.5 The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

A.23.5.5.1.1 Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A.23.5.5.2 A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

A.23.5.5.2.1 Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 23.5.5.2.1 which...
meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab
bar options with 103 independent-living seniors with average age of 70. ("Evaluation of Optimal
Bath Grab Bar Placement for Seniors," by H. Sveistrup, D. Lockett, N. Edwards and F.
Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation,
2003.)

A. 23.5.5.3.1 The best performing grab bars are in the middle third of the permitted range for
circular diameter. For some grab bar designs, with undulations and other surface geometry
features to improve slip resistance for users' hands, these dimensions will be nominal with small
variations depending on where measurements are taken. Children and others with smaller
hands will be able to use best the diameters within the lower part of the permitted range. When
using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might
dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With
grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms
of users, there is some concern about people's hands slipping into the clear space; however this
can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and
most grab bar designs provide. Thus the main difference in the end result is where, along its
length, the arm gets wedged behind the grab bar, not the complete prevention of this happening
at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some
of which could entail some judgment (for example, with different bath tub lengths and heights). Further
justification is provided in the outline justification and supplementary justification information provided
with the base text to which these notes relate. Clarification is also provided about the closest ANSI
standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid
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Committee Statement

Resolution: The proposed Annex A language has been incorporated into the related Section A.11.X
provisions.
A.24.5.5 The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

A.24.5.5.1.1 Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A.24.5.5.2 A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

A.24.5.5.2.1 Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 24.5.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab bars.
bar options with 103 independent-living seniors with average age of 70. (“Evaluation of Optimal Bath Grab Bar Placement for Seniors,” by H. Sveistrup, D. Lockett, N. Edwards and F. Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation, 2003.)

A. 24.5.5.3.1 The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users’ hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people’s hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

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Committee Statement

Resolution: The proposed Annex A language has been incorporated into the related Section A.11.X provisions.
The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 25.5.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab bars.
bar options with 103 independent-living seniors with average age of 70. ("Evaluation of Optimal Bath Grab Bar Placement for Seniors," by H. Sveistrup, D. Lockett, N. Edwards and F. Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation, 2003.)

A. 25.5.5.3.1 The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users' hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people's hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

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Committee Statement

Resolution: The proposed Annex A language has been incorporated into the related Section A.11.X provisions.
[NOTE:  This Public Input is to also make the same set of new Annex text as shown here for 26.2.5.4, for Large Facilities, in a new Annex Section for 26.3.5.4.]

**A.26.2.5.4** The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

**A.26.2.5.4.1.1** Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

**A.26.2.5.4.1.2** A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

**A.26.2.5.4.2.1** Using the mid points of the distance ranges and the minimum distance from the...
control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar
(or alternatively, a horizontal grab bar fairly similar to the option provided by 26.5.5.2.1 which
meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab
bar options with 103 independent-living seniors with average age of 70. ("Evaluation of Optimal
Bath Grab Bar Placement for Seniors," by H. Sveistrup, D. Lockett, N. Edwards and F.
Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation,
2003.)

A.26.2.5.4.3.1 The best performing grab bars are in the middle third of the permitted range for
circular diameter. For some grab bar designs, with undulations and other surface geometry
features to improve slip resistance for users’ hands, these dimensions will be nominal with small
variations depending on where measurements are taken. Children and others with smaller
hands will be able to use best the diameters within the lower part of the permitted range. When
using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might
dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With
grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms
of users, there is some concern about people’s hands slipping into the clear space; however this
can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and
most grab bar designs provide. Thus the main difference in the end result is where, along its
length, the arm gets wedged behind the grab bar, not the complete prevention of this happening
at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some
of which could entail some judgment (for example, with different bath tub lengths and heights). Further
justification is provided in the outline justification and supplementary justification information provided
with the base text to which these notes relate. Clarification is also provided about the closest ANSI
standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid
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Submittal Date: Sun Jul 05 15:59:57 EDT 2015

Committee Statement

Resolution: The proposed Annex A language has been incorporated into the related Section A.11.X
provisions.
PUBLIC INPUT No. 169-NFPA 5000-2015 [NEW SECTION AFTER A.26.3.5.3.2]

TITLE OF NEW CONTENT

A.26.3.5.4 The grab bars required in this section are designed to improve safety of showering and bathing by ambulatory users, typically entering and exiting a bath, bathtub-shower combination or shower facility for showering while standing or for other forms of bathing which can entail transition to/from a crouching or sitting position. The second sentence of this requirement is intended to make sure that grab bars, if provided voluntarily—i.e., as non-required—for dedicated showers, must meet the requirements of the section—so that something appearing to be a grab bar can effectively perform as one. However such grab bars would only be considered non-required in the case of dedicated showers not involving misstep and fall dangers addressed by 11.1.6.2 and 11.1.6.4. This means that walking surfaces must be at least as safe, in terms of underfoot conditions, as any other portion of the means of egress (where, for example, handrails are not required) for users not having mobility disabilities. This would require exceptionally careful choice, and maintenance, of underfoot materials as well as very effective control of water within and adjacent to the dedicated shower facility.

For grab bar requirements appropriate for other uses and users, especially users with disabilities, refer to requirements in ICC ANSI A117.1, Standard for Accessible and Usable Buildings and Facilities. Generally, the grab bars specified for this Code will not interfere with other grab bars installed in accordance with requirements of ICC ANSI A117.1 and they can contribute to meeting the requirements of ICC ANSI A117.1 and vice versa. For example, combination vertical and horizontal grab bars (in an L configuration), as addressed by ICC ANSI A117.1, can meet the requirements of this Code for a vertical grab bar. Similarly requirements for a horizontal grab bar on the back wall are compatible.

Dimensions for height of grab bars are based on typical, mass-produced bathtubs with a wall height, above the finished floor of about 15 inches (380 mm) and the bottom of the bathtub within an inch or two of the finished floor elevation. Adjustments to stipulated grab bar height limits and ranges, referenced to the bath tub rim, should be considered for bath tubs having higher walls, and thus rim heights, above the bottom of the tub and, possibly, also the wall height above the finished floor. ICC ANSI A117.1 references grab bar height dimensions to the bathtub rim and, for consistency with this widely used ANSI standard, that convention is maintained in this Code.

A.26.3.5.4.1.1 Grab bars located where they interfere with sealing, with a shower curtain, against escape of water—especially to the floor surface outside the shower facility—might introduce safety problems in the form of greatly reduced slip resistance of the walking surface (which could violate this Code). This is avoided with a 6-inch, horizontal separation between the shower curtain rod and the grab bar. It is assumed that other forms of water control, such as an installed enclosure, will not interfere with the use of grab bars.

A.26.3.5.4.1.2 A free-standing pole, satisfying requirements for a grab bar, can offer much flexibility in placement, for example, within the close quarters of a small bathroom where there is a water closet adjacent to the bathing facility and a single grab bar can serve both facilities. Where the bathing facility is free standing, without walls, especially with large soaking tubs, including those on pedestals, the vertical pole-type grab bar is especially useful. The pole also can solve fixing problems with walls that are nonexistent or difficult to use for installing conventional, wall-mounted grab bars.

A.26.3.5.4.2.1 Using the mid points of the distance ranges and the minimum distance from the control end wall results in a 45-degree angle for the diagonal grab bar. Such a diagonal grab bar (or alternatively, a horizontal grab bar fairly similar to the option provided by 26.5.5.2.1 which meets requirements of ICC ANSI A117.1) was found suitable in tests performed of several grab bars.
bar options with 103 independent-living seniors with average age of 70. (“Evaluation of Optimal Bath Grab Bar Placement for Seniors,” by H. Sveistrup, D. Lockett, N. Edwards and F. Aminzadeh, University of Ottawa with funding by Canada Mortgage and Housing Corporation, 2003.)

A.26.3.5.4.3.1 The best performing grab bars are in the middle third of the permitted range for circular diameter. For some grab bar designs, with undulations and other surface geometry features to improve slip resistance for users’ hands, these dimensions will be nominal with small variations depending on where measurements are taken. Children and others with smaller hands will be able to use best the diameters within the lower part of the permitted range. When using a free-standing pole for a grab bar, structural considerations, especially for stiffness, might dictate using diameters in the upper part of the permitted range.

Note that a maximum clearance between the grab bar and an adjacent surface is specified. With grab bars, especially horizontal ones, on which large, downward loads are imposed by the arms of users, there is some concern about people’s hands slipping into the clear space; however this can occur even with an absolute 1.5 inch (38 mm) clearance, as some standards specify and most grab bar designs provide. Thus the main difference in the end result is where, along its length, the arm gets wedged behind the grab bar, not the complete prevention of this happening at all.

Statement of Problem and Substantiation for Public Input

The Annex notes provide clarification and helpful information generally about the requirements some of which could entail some judgment (for example, with different bath tub lengths and heights). Further justification is provided in the outline justification and supplementary justification information provided with the base text to which these notes relate. Clarification is also provided about the closest ANSI standard addressing some of the same issues, ANSI A117.1 for which an effort was made to avoid conflicting requirements.

Submitter Information Verification

Submitter Full Name: JAKE PAULS
Organization: JAKE PAULS CONSULTING SERVICES
Affiliation: Myself and Linda Strobl, Public Health Nurse, Ontario
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jul 05 16:03:50 EDT 2015

Committee Statement

Resolution: The proposed Annex A language has been incorporated into the related Section A.11.X provisions.
A.27.4.4.2.5(a) An open mall concourse is permitted to serve as the public way provided that the open mall concourse meets the definition of public way in accordance with this Code.

Statement of Problem and Substantiation for Public Input

Statement: Proposed annex language clarifies the application of Section 27.4.4 to open mall concourses. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 15:14:36 EDT 2015

Committee Statement

Resolution: CI-6513-NFPA 5000-2015
Statement: The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses. The proposed Committee Input is developed with the intent of soliciting public comment and additional review by the mall task group and is focused on the definition of open and enclosed mall concourses as well as the impact of open mall concourses on existing code requirements. Prior to the Second Draft meeting the task group will continue to meet and review the code requirements for open versus enclosed mall concourses and determine how the code is to be appropriately applied to either open or enclosed mall concourses. The task group is looking at areas such as egress travel, fire protection systems and protection of the mall concourse, as well as protection and presence of kiosks and equipment within the mall concourse.

It should be noted that the term 'mall' will be replaced with 'mall concourse' and 'mall'
building' will be replaced with 'mall structure' pending the results of revisions made by the Committee during the First Draft meeting.
A.27.4.4.2.2
A mall building might enclose one or more uses, such as retail stores, drinking establishments, entertainment and amusement facilities, offices, and other similar uses.

A.27.4.4.2.2 A mall structure can include either an enclosed mall concourse or an open mall concourse. A mall structure may be enclosed by a variety of construction. Such construction could range from total enclosure to construction which is open either partially or totally open to the outer air. For structures without complete walls and/or roof, the terminations of the mall exit discharge would determine the extent of the structure.

Statement of Problem and Substantiation for Public Input

Statement: Proposed new annex language offers additional details regarding the construction of mall structures and better clarifies the intent of the term “mall structure” versus “mall building”. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 15:12:55 EDT 2015

Committee Statement

Resolution: CI-6513-NFPA 5000-2015
Statement: The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses. The proposed Committee Input is developed with the intent of soliciting public comment and additional review by the mall task group and is focused on the definition of open and enclosed mall concourses as well as the impact of open mall concourses on existing code requirements. Prior to the Second Draft meeting the task group will continue to meet and review the code requirements for open versus enclosed mall concourses and determine how the code is to be appropriately applied to either open or enclosed mall concourses. The task group is looking at areas such as egress travel, fire protection systems and protection of the mall...
concourse, as well as protection and presence of kiosks and equipment within the mall concourse.

It should be noted that the term 'mall' will be replaced with 'mall concourse' and 'mall building' will be replaced with 'mall structure' pending the results of revisions made by the Committee during the First Draft meeting.
TITLE OF NEW CONTENT
Type your content here ...

A.27.4.4 This Section provides an optional, not mandatory, arrangement for the design and construction of mall structures. At the discretion of the designer, these structures may be designed as a single building provided that they comply with the applicable requirements of the intended occupancy, and with the requirements of Section 6.2 for buildings housing more than one occupancy.

Statement of Problem and Substantiation for Public Input

Statement: Facilities that function as a shopping mall are not required to apply the special provisions of Section 27.4.4, rather it is an option. Proposed text clarifies that application. The proposed text, in conjunction with updated terminology for mall structure and mall concourse and new definitions for open and enclosed mall concourses, further clarifies the application of the Section for the multiple type of mall structures existing and under construction in the field today. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Thu Jul 02 15:11:04 EDT 2015

Committee Statement

Resolution: FR-6510-NFPA 5000-2015
Statement: Facilities that function as a shopping mall are not required to apply the special provisions of Section 27.4.4, rather it is an option. Proposed text clarifies that application. The proposed text, in conjunction with updated terminology for mall structure and mall concourse and new definitions for open and enclosed mall concourses, further clarifies the application of the Section for the multiple type of mall structures existing and under construction in the field today. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.
TITLE OF NEW CONTENT

Type your content here ...

A.27.4.4.5.2 Where an open mall concourse meets the requirements for a public way, the means of egress from each tenant space or building is permitted to terminate at the open concourse public way. For those arrangements, the open mall concourse would not be considered as a portion of the means of egress.

Statement of Problem and Substantiation for Public Input

Statement: Proposed annex language clarifies the application of Section 27.4.4 to open mall concourses. The proposed changes are the result of task group work that was initiated at the completion of the 2015 revision cycle and will continue through the 2018 cycle. The focus of the task group was to update terminology related to shopping malls to better describe the applicability and intent of the Code sections as well as develop language to address both enclosed and open type mall concourses.

Submitter Information Verification

Submitter Full Name: DAVID DODGE
Organization: SAFETY AND FORENSIC CONSULTING
Affiliation: ASSE
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 02 15:18:24 EDT 2015

Committee Statement

Resolution: FR-6511-NFPA 5000-2015
Statement: Proposed annex language clarifies the application of 27.4.5.2 for applying the code to the pedestrian way. While related to the provisions for mall buildings, the change is independent of the task group work. The concept is important regardless of the pending changes proposed by the task group and is applicable to the current code text.
Stationary battery systems are being used in an ever increasing number of applications in the built environment, including providing facility standby power, emergency power, uninterrupted power supplies and/or load shedding/load balancing applications. There are significant potential hazards associated with these systems, which are effectively addressed in Chapter 52 of the Fire Code.

Statement of Problem and Substantiation for Public Input

This annex note helps explain the purpose of this section.

Submitter Information Verification

Submitter Full Name: HOWARD HOPPER  
Organization: UL LLC  
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 15:06:35 EDT 2015

Committee Statement

Statement: Stationary battery systems are being used in an ever increasing number of applications in the built environment, including providing facility standby power, emergency power, uninterrupted power supplies and/or load shedding/load balancing applications. There are significant potential hazards associated with these systems, which are effectively addressed in the Fire Code. It is prudent to provide a link to these requirements to address these systems.

The new annex note helps explain the purpose of this section.
**Public Input No. 71-NFPA 5000-2015 [Section No. D.2.3.2.14]**

**D.2.3.2.14 Plenums.**

Plenums shall be permitted to be used to supply air to the occupied area, or return and exhaust air from the occupied area, provided that the requirements of 7.2.3.2.15 through 7.2.3.2.21 NFPA 90A are met.

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**Statement of Problem and Substantiation for Public Input**

The referenced sections 7.2.3.2.15 through 7.2.3.2.21 do not exist within NFPA 5000.

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**Submitter Information Verification**

- **Submitter Full Name:** MARCELO HIRSCHLER
- **Organization:** GBH INTERNATIONAL
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Tue Jun 30 15:58:11 EDT 2015

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**Committee Statement**

- **Resolution:** FR-1005-NFPA 5000-2015
- **Statement:** The referenced sections 7.2.3.2.15 through 7.2.3.2.21 do not exist within NFPA 5000. Those provisions were removed in the 2012 edition but the corresponding changes to Annex D were not made. This corrects that oversight.
Public Input No. 152-NFPA 5000-2015 [Section No. G.3]

G.3 Application.

Statement of Problem and Substantiation for Public Input

The title may be changing. The two documents are in discussions on merging.

Submitter Information Verification

Submitter Full Name: Jim Muir
Organization: Building Safety Division, Clark County, Washington
Affiliation: NFPA’s Building Code Development Committee (BCDC)
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 04 18:45:35 EDT 2015

Committee Statement

Resolution: The committee has received no substantiation that the document title has been changed.
Annex H  Informational References

H.1  Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.
H.1.1 NFPA Publications.
National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.


H.1.2 Other Publications.

H.1.2.1 ACI Publications.

American Concrete Institute, P.O. Box 9594, 38800 Country Club Drive, Farmington Hills, MI 48333-3434.


H.1.2.2 ANSI Publications.

American National Standards Institute, Inc., 25 West 43rd Street, 4th floor, New York, NY 10036.


H.1.2.3 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.


ASCE 41, Seismic Evaluation and Retrofit Of Existing Buildings, 2013. (Supersedes FEMA 356)


H.1.2.4 ASHRAE Publications.

ASHRAE, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.


H.1.2.7  ASTM Publications.


H.1.2.13 ICC Publications.

International Code Council, 5203 Leesburg Pike, Suite 600, Falls Church, VA 22041. 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001-2070.


H.1.2.14 IEC Publications.

International Electrotechnical Commission, 3 rue de Varembé, P.O. Box 131, 1211 Geneva 20, Switzerland.


H.1.2.15 SFPE Publications.

Society of Fire Protection Engineers,

7315 Wisconsin Avenue

9711 Washington Blvd., Suite 620E

380

Bethesda

Gaithersburg, MD

20814

20878:

www.sfpe.org


H.1.2.16 RESNA Publications.


H.1.2.17 SFPA/SPC Publications.

Southern Forest Products Association, 6660 Riverside Drive, Metairie, LA 70003/Southern Pine Council, P.O. Box 641700, 2900 Indiana Avenue, Kenner, LA 70065-1700.


H.1.2.18 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.


UL Subject 1588 Outline, Outline of Investigation for Roof and Gutter De-Icing Cable Units, 2002.


UL 2424 Outline, Outline of Investigation for Cable Marked Limited Combustible, 2006.


H.1.2.19 UN Publications.


40 Code of Federal Regulations, Title 260 to 265 and 266 to 299, Hazardous Waste Management System-General

47 Code of Federal Regulations, Title 47 Telecommunications.


49 Code of Federal Regulations, Title 84, Transportation.

EPA, EPA-402-R-93-021.


FEMA 356, Prestandard and Commentary for the Seismic Rehabilitation of Buildings, 2000. (Superseded by ASCE 41)


Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Weather Bureau, Dept. of Commerce, 1961.

H.1.2.21 Other Publications.


Industrial Ventilation: A Manual of Recommended Practice, 23rd- 2 Volume Set, 2013. (Includes the 2 following documents.)


Klote and Milke, Principles of Smoke Management Systems.


H.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.


H.3 References for Extracts in Informational Sections.


Statement of Problem and Substantiation for Public Input

Referenced current SDO names, addresses, standard names, numbers, and editions.

Related Public Inputs for This Document

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<thead>
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<th>Relationship</th>
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<td>Public Input No. 4-NFPA 5000-2015 [Global Input]</td>
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Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [ Not Specified ]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Feb 13 02:08:10 EST 2015

Committee Statement

Resolution: See the multiple FRs that revise Annex H.
H.1.1 NFPA Publications.
National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.


**NFPA 70®, National Electrical Code®, 2014 edition.**


NFPA 909, Code for the Protection of Cultural Resource Properties — Museums, Libraries, and

Statement of Problem and Substantiation for Public Input

I proposed adding Annex information (A.55.1.4.2) to recommend commissioning of integrated fire protection and life safety systems. If that Public Input is accepted, this reference should be added.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: THOMAS HAMMERBERG
Organization: AUTOMATIC FIRE ALARM ASSOCIATION
Affiliation: Automatic Fire Alarm Association
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Jul 06 08:48:32 EDT 2015

Committee Statement

Resolution: FR-6083-NFPA 5000-2015  
Statement: Annex text is being added to Chapter 55 relative to commissioning of integrated fire protection and life safety systems; NFPA 3 is offered as an information resource. As such, it belongs in current Annex H.
AISC DG02, Steel and Composite Beams with Web Openings, 2003.

Statement of Problem and Substantiation for Public Input

This proposal is simply picking up the reference to AISC DG-02, which is mentioned in Annex A, Section A.44.2.1.

Submitter Information Verification

Submitter Full Name: BONNIE MANLEY
Organization: AMERICAN IRON AND STEEL INSTIT
Affiliation: AISC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 06 13:34:13 EDT 2015

Committee Statement

Resolution:
Statement: The AISC document is referenced in Annex A; as such, it belongs in current Annex H.
H.1.2.7 ASTM Publications.
Statement of Problem and Substantiation for Public Input

date updates

Submitter Information Verification

Submitter Full Name: MARCELO HIRSCHLER
Organization: GBH INTERNATIONAL
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jun 04 13:12:34 EDT 2015

Committee Statement

Resolution: FR-6086-NFPA 5000-2015
Statement: Updating/correcting references
Public Input No. 195-NFPA 5000-2015 [Section No. H.1.2.11]

H.1.2.11  FM Global Publications.
FM Global, 270 Central Avenue, P.O. Box 7500, Johnston, RI 02919.
FM Data Sheet 1-22, Maximum Foreseeable Loss, 2009 - 2014.
FM Data Sheet 1-29, Roof Deck Securement and Above-Deck Roof Components, 2009 - 2010.
FM 4450, Approval Standard for Class 1 Insulated Steel Deck Roofs, 1989.

Statement of Problem and Substantiation for Public Input

Updated all references to FM Global documents. All FM Global data sheets and approval test standards are available for free at fmglobal.com or fmapprovals.com.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: RICHARD DAVIS
Organization: FM GLOBAL
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Jul 06 12:48:20 EDT 2015

Committee Statement
Resolution: FR-6087-NFPA 5000-2015
Statement: Updating/correcting references
H.1.2.18 UL Publications.
Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.
UL Subject 1588, Outline of Investigation for Roof and Gutter De-Icing Cable Units, 2002.
UL 2424, Outline of Investigation for Cable Marked Limited Combustible, 2006.

Statement of Problem and Substantiation for Public Input

Proposed changes reflect updated editions of UL Standards.

Submitter Information Verification

Submitter Full Name: RONALD FARR
Organization: UL LLC
Street Address: National Fire Protection Association Report
City: http://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentPara...
Committee Statement

Resolution: FR-6088-NFPA 5000-2015
Statement: Updating/correcting references